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McNEW (G. L.). **Effect of seed treatment on the stand and yield of Peas.**—*Canner*, xcii, 6, pp. 56, 58, 60, 62; xcii, 7, pp. 16, 18, 20, 2 figs., 1941.

Most of the canning companies in New York are stated to treat pea seed with red copper oxide [*R.A.M.*, xix, p. 257] as a protective measure against attacks by soil-inhabiting fungi (*Pythium ultimum* and other species). The total cost of the treatment (graphite being added to the red copper oxide to facilitate drilling of the seed) is only about 45 cents per acre (for 4½ bush. of seed) and is considered to pay for itself if it prevents a complete failure of stand in one field out of 90, or saves 2·2 per cent. of the seed from decay.

In view of the conflicting results obtained with the treatment of peas in various localities, and because red copper oxide is known to be injurious to some varieties, 15 field trials, following preliminary greenhouse and laboratory tests, were carried out in the spring of 1940 with the varieties Surprise, Pride, Green Admiral, Wisconsin Early Sweet, Rogers Ace, Rogers Climax, and Rogers Famous. The seed, supplied by the canning companies from their regular stock, was treated with various chemicals, namely cuprocide (red copper oxide), spergon (a new fungicide), and semesan at the rate of 2½ oz. per bush., 2 per cent. ceresan at 2 oz., and new improved ceresan at 1 oz. per bush. in a rotating barrel churn for five minutes and then distributed to farmers. The results showed that the late varieties Pride and Green Admiral were more subject to decay than Surprise and are, therefore, as much in need of treatment as the early ones. The following conclusions are drawn from the data obtained. The treatment with cuprocide and graphite is very effective, but may under some conditions cause slight injury to the plant. It is, however, the least expensive of the treatments tested and where it has proved satisfactory before, its use may be continued. Of the organic mercury compounds tested, 2 per cent. ceresan, although not quite as effective as red copper oxide, is probably the most practical to use, semesan being very effective but too expensive. Both mercurials need the addition of graphite. New improved ceresan proved too injurious to plants and should not be used. To reduce the rate of its application would be of little use, since even at 1 oz. per bush. it was never as effective as cuprocide and spergon. This latter material offered distinct promise, being absolutely non-injurious to all pea varieties tested and safe on all soils with reaction

between P_H 6·1 and 7·8. Yield records showed that spergon gave an increase in production regardless of whether seed decay was severe or not. Its price is rather high at present, but it is hoped that it will be reduced as soon as its production on a commercial scale is started.

ALFARO (A.) & SILVAN (A.). **La 'tabaquera' de las Judias.** ['Snuff' of French Beans.]—*Bol. Pat. veg. Ent. agric., Madr.*, ix, 35–38, pp. 9–20, 11 figs., 1940.

During 1935 the authors commenced a study of bean [*Phaseolus vulgaris*] blight (known locally in Saragossa as 'snuff'), caused by *Bacterium phaseoli*, this being apparently the first true record of the disease for Spain. The causal organism is distinguishable from *Phytomonas* [*Bact.*] *medicaginis* var. *phaseolicola* (already reported for the country but originally confused with *Bact. phaseoli* [*R.A.M.*, xv, p. 765; xvii, p. 720]) by its capacity to liquefy gelatine and decompose starch. The symptoms of the disease, the morphological and cultural characters of its agent, and the mode of infection are described, and control measures based on crop rotation, the development of resistant varieties, use of clean seed, and destruction of contaminated refuse are briefly discussed.

BEATTIE (W. R.). **Lettuce growing.**—*Fmrs' Bull. U.S. Dep. Agric.* 1609, 29 pp., 20 figs., 1940.

On pp. 22–23 of this bulletin an account is given of the diseases commonly affecting the lettuce crop in the United States. Tipburn [*R.A.M.*, xix, p. 328] is regarded as a non-parasitic disease, developing during warm weather, especially when warm, bright days follow periods of fog or rain. The disorder is much reduced by good cultural methods and in particular by providing proper soil moisture in irrigated regions. Simple tipburn is characterized by brown, dead areas free from decay, along the leaf margin, but secondary organisms often cause a soft rot. Downy mildew [*Bremia lactucae*: ibid., xix, p. 577] is widespread, but in the eastern States is troublesome only under greenhouse conditions. There are marked varietal differences in susceptibility, and crossing the better commercial types with highly resistant varieties has increased the resistance of the former. The problem is rendered more difficult by the existence of different physiologic races of the fungus [loc. cit.]. The disease also affects wild lettuce, which should be eradicated from the vicinity of lettuce fields and greenhouses. Crop rotation is recommended, and applications of Bordeaux mixture made while the plants are young [cf. ibid., xviii, p. 155] keep the disease in check and may considerably reduce injury to the crop.

Notes are also given on lettuce drop [*Sclerotinia sclerotiorum*; ibid., xvii, p. 290], brown blight [ibid., xix, p. 324], to which several strains of the New York type of lettuce are resistant, and damping-off [ibid., xvii, pp. 365, 502; xix, p. 519].

UPPAL (B. N.), VARMA (P. M.), & CAPOOR (S. P.). **Yellow mosaic of Bhendi.**—*Curr. Sci.*, ix, 5, pp. 227–228, 1 fig., 1940.

Yellow mosaic of bhendi (*Hibiscus esculentus*) is stated to be widespread in the Poona district of India, where it seriously affects fruit production The first perceptible symptom is clearing of the small

veins, and then of the larger ones, the ill-defined, yellowish-green to pale yellow areas later extending into the mesophyll. In severely diseased plants, the young leaves develop a generalized chlorosis rather than actual mosaic patterns. All growth produced subsequent to infection is stunted, the leaves being under-sized and the petioles abnormally short. Flowering is sparse and few fruits are formed. Thickening of the veins on the lower leaf surface is a feature of the disorder in the greenhouse.

The virus of yellow mosaic is neither sap- nor seed-transmissible, but it is readily conveyed by grafting from diseased to healthy plants, and was further experimentally transferred by *Bemisia gossypiperda* from *H. esculentus* to hollyhocks and back to the original host, but not to Sakel cotton.

WHEELER (D. P.). **Black mildew or Spanish measles.**—*Calif. Cultiv.*, lxxxvii, 6, p. 180, 1940. [Abs. in *Biol. Abstr.*, xv, 1, pp. 138–139, 1941.]

Black mildew or Spanish measles (the former name being regarded as the more appropriate), due to an undetermined wood-rotting fungus, is considered to be the most serious grape disease in the San Joaquin Valley of California, where most vineyards sustain an average loss of 5 and a maximum of 10 to 15 per cent. of the fruit, accompanied by decline in vigour and sometimes by the death of the vines. The foliar symptoms are reddening, russeting, or desiccation, while the fruit is under-sized and may crack or shrivel. Control may be effected by spraying the dormant vines immediately after pruning with sodium arsenite at the rate of 3 lb. per 50 gals., supplemented by timely fertilizing (including the addition of minor elements), moderate pruning, and frequent but shallow irrigation.

PADWICK (G. W.) & UPPAL (B. N.). **The problem of inter-provincial plant quarantines in India.**—*Indian J. agric. Sci.*, x, 5, pp. 697–706, 1940.

Six categories of Indian crops may be differentiated for quarantine purposes, viz., (1) the staple foodstuffs (grains and pulses), grown mainly in the northern plains and southern lowlands; (2) the subtropical and tropical fruits, with a similar distribution; (3) commercial crops cultivated over a limited area, e.g., jute, tea, and coffee; (4) industrial crops grown on a wide scale, such as cotton, tobacco, and sugar-cane; (5) temperate fruit crops grown in the hills; and (6) temperate vegetables in widespread cultivation—in the hills in warm weather and on the plains during the cold season. A perusal of various relevant publications relating to India has yielded information concerning 68 diseases of such important crops [a tabulated list of which is given]; in 33 instances the causal organisms are distributed throughout the country, while a further 14 at least may be found within the narrow geographical confines of the particular host involved.

The problem of the enforcement of quarantine measures has been considered under various aspects, taking as a basis the principles accepted by the National Plant Board of the United States, i.e., (1) the pest against which action is proposed must jeopardize substantial

interests; (2) no better substitute for quarantine can be devised; (3) reasonable prospects of the success of the measure must exist; and (4) the economic gains must outweigh the administrative costs. In the light of these provisions, the several crop categories have been individually studied from the standpoint of the five types of quarantine action recognized by McCubbin [*R.A.M.*, xvi, p. 223], namely, embargo, detention, disinfection, inspection, and unrestricted entry, and the conclusion has been drawn that the only strong case for inter-provincial quarantine under existing conditions in India is that of the temperate fruit crops of the hills, though the quarantining of propagating material may be advisable against banana bunchy top, recently suspected in two places in India [ibid., xix, p. 584], and rubber mildew (*Oidium heveae*).

Sixty-fifth Annual Report of the Ontario Agricultural College and Experimental Farm, 1939.—69 pp., 1940. [Received February, 1941.]

The following items of phytopathological interest occur in various sections of this report. As in previous years, the Erban variety of oats showed marked resistance to loose and covered smuts [*Ustilago avenae* and *U. kolleri*], similar reactions also being manifested by Ripon, Banner (purified), and Bannock. Erban is likewise resistant to leaf [crown] rust [*Puccinia coronata*].

During the period under review *Phytophthora cactorum* destroyed nearly all the fruits on the lower trusses of two glass-house tomato crops. The spread of the fungus was arrested by keeping the water off the fruit and removing some of the lower leaves to admit sunlight and air.

Mould growth in cheese was experimentally shown to be controllable for a fortnight at temperatures up to 50° F. by 30 seconds' immersion of the cut slices in a 10 per cent. solution of calcium propionate [*R.A.M.*, xx, p. 173].

Divisions of Plant Pathology and Seed Investigations.—*Rep. N.Y. St. agric. Exp. Sta., 1939–40*, pp. 23–28, 37–42, 1941.

In tests of Bordeaux mixture (1½–9–100) and other copper-containing preparations used for spraying apple trees [against scab: *Venturia inaequalis*: *R.A.M.*, xix, p. 199], a high lime content in the former was again found to be absolutely essential for the avoidance of injury. Two lb. hydrated lime for each ¼ lb. actual copper in the insoluble coppers gave a marked decrease of injury over 1 lb. in the first cover spray, a reduction to 1 lb. being permissible in subsequent treatments. The copper silicates were the safest of the materials tested and the basic copper sulphates the most hazardous, at any rate for the first cover, the copper oxychlorides being intermediate in this respect. The particle size of coppers was found to be an important factor in the occurrence of spray injury, which was reduced to a minimum without sacrifice of efficiency by the use of brands with an average particle size of 10 μ.

Complete elimination of peach leaf curl (*Exoascus* [*Taphrina*] *deformans*) was obtained by spring applications of Bordeaux mixture

(1½–1½–100), lime-sulphur (3–100), or 0·5 per cent. elgetol [ibid., xx, p. 212].

The yellow-red virus or X-disease of peaches [ibid., xx, p. 213] is stated to be well established in New York State on its wild host, *Prunus virginiana*, the eradication of which for a radius of 500 ft. from healthy peach orchards appears to be the only means of combating the disease. Total destruction of the wild host of the virus was accomplished by spraying the leaves in July with sodium chlorate at the rate of 75 lb. per 100 gals. water.

Young sweet cherry trees sustained exceptionally heavy damage from the cankers associated with *Phytomonas* [*Pseudomonas*] *cerasi* [ibid., xviii, p. 689], the green fluorescent bacteria isolated from the margins of the lesions producing typical symptoms on inoculation into healthy young trees in the spring or autumn.

The past two years' observations have shown that the eradication methods for raspberry mosaic control practised in the Hudson Valley are not usually successful, while elsewhere in the State the efficacy of roguing depends on the relative freedom of the plantings from the insect vector of the virus, *Amphorophora rubi* [ibid., xviii, p. 190], and the extent of the area under the Columbian variety in the vicinity. Out of 67 red raspberry varieties and seedlings tested for resistance to mosaic, Marcy, Indian Summer, and 34 seedlings have remained free from the disease.

Spur blight of raspberries (*Didymella applanata*) does not ordinarily assume a serious form until a planting is four or five years old. Excellent results were obtained during the past season by thorough spraying of the canes in the green-tip stage with 1 per cent. elgetol or 1 in 8 lime-sulphur.

Verticillium albo-atrum in red, black, and purple raspberries has been effectively combated over a two-year period by the systematic roguing of diseased plants.

Bean [*Phaseolus vulgaris*] mosaic was very severe in the west of the State in 1939, practically every individual being diseased in sections planted with susceptible varieties, such as Stringless Green Refugee [ibid., xix, p. 450], which in five fields under observation yielded only 2·45 tons per acre compared with 3·94 and 3·84 for the resistant U.S. No. 5 Refugee and Idaho Refugee, respectively.

Bordeaux mixture (4–4–50) was the most effective of the preparations tested for the prevention of tomato leaf blight [*Septoria lycopersici*], but it caused some retardation of growth in the early sprays: this defect being absent from some of the fixed copper compounds [ibid., xx, p. 181], they (especially cuprocide 54–7) are being recommended as substitutes for application at this stage.

The fungi most commonly associated with root rot of peas were *Fusarium solani* var. *martii* f. 2, *F. oxysporum* f. 8 [ibid., xviii, p. 777], *Aphanomyces euteiches* [ibid., xx, p. 211], *Rhizoctonia* [*Corticium*] *solani*, and *Ascochyta* [*Mycosphaerella*] *pinodes*. Foot rot of the same host is chiefly associated with *F. solani* var. *martii* f. 2, while *F. oxysporum* f. 8 is also prevalent in warm, dry seasons, such as that of 1939–40; the following species, commonly isolated from the older diseased tissues of the foot and root, are apparently saprophytic under normal conditions:

F. anguioides, *F. equiseti*, *F. scirpi* var. *acuminatum*, *F. arthrosporioides*, *F. poae*, *F. sporotrichoides*, and *F. culmorum*.

Field tests and epidemiological studies, covering a five-year period, on hop downy mildew [*Pseudoperonospora humuli*] have shown that the oospores of the fungus are the principal, if not the sole, means of overwintering. The critical time for protection extends from the first appearance of the flower buds to the end of the burr stage; the initial spray application should coincide with the establishment of the pathogen on the plants about 5 ft. above soil-level.

The efficacy of sulphur against powdery mildew of hops [*Sphaerotheca humuli*], the existence of physiologic races of which is suspected, depends on its application, in dry or liquid form, before the appearance of foliar infection. Eradicant or curative sprays are necessary for the arrest of epidemics.

Botany and plant pathology.—*Rep. Ohio agric. Exp. Sta., 1937–8* (*Bull.* 600), pp. 20–25, 3 figs., 1939. [Received March, 1941.]

In this report [cf. *R.A.M.*, xviii, p. 785], it is stated that during the period under review apple leaves from trees in Ohio sprayed with lime-sulphur and flotation sulphur when measured early in July showed, respectively, 25 and 5 per cent. reduction in leaf area, as compared with the unsprayed controls. Leaf stunting due to lime-sulphur, when taken in conjunction with visible injury due to the treatment, must be regarded as serious, especially under adverse seasonal conditions, when fruit set, size, finish, and quality are all much impaired. The evidence from many tests indicates that only flotation sulphur is a satisfactory substitute for lime-sulphur against scab [*Venturia inaequalis*], the other wettable sulphurs failing to control infection during seasons favourable to it. A new spray schedule for apples [against *V. inaequalis*] is therefore suggested: lime-sulphur in the delayed dormant and pre-pink stages, and flotation sulphur paste subsequently, the quantities used being 12 lb. before bloom, 10 lb. at calyx, and 8 lb. subsequently, per 100 gals. of water. Flotation sulphur paste also controls frog eye [*Physalospora obtusa*: ibid., xvii, pp. 465, 688], but some form of copper is necessary for the control of bitter rot [*Glomerella cingulata*: ibid., xviii, p. 235] and blotch [*Phyllosticta solitaria*: ibid., xvii, p. 608].

Standard-strength lime-sulphur, applied to sour cherry trees against leaf spot [*Coccomyces hiemalis*: ibid., xix, p. 661] reduced leaf area by 40 per cent., and in the two seasons under review failed to control infection, though many of the fixed copper compounds gave effective control without producing stunting. The new schedule recommended is 3 lb. fixed copper (based on 25 per cent. metallic), 3 lb. hydrated lime, and water to make 100 gals. Three or four applications suffice. The results obtained in small-scale tests indicated that the same schedule is suitable for sweet cherries and plums.

Much progress was thought to have been made in the control of tomato leaf mould [*Cladosporium fulvum*: ibid., xix, p. 644] by the development of the resistant Globelle variety, until new strains of the fungus appeared [ibid., xix, p. 308], but an attempt is now in progress to sort out the strains and develop a generally resistant plant. The

disease causes heavy losses to spring and autumn crops, and has not proved controllable by spraying.

Considerable progress has been made in the control of pickle [cucumber] and melon wilt [*Erwinia tracheiphila*: ibid., xix, pp. 190, 694]. The use of a copper fungicide has been found to be very important, and a dust combination consisting of 12 lb. fixed copper (based on 25 per cent. metallic), 20 lb. flour, 5 lb. calcium arsenate, and talc sufficient to make 100 lb. has been widely adopted. It covers about twice as many vines per lb. as calcium arsenate-gypsum dust, has much better adhesive qualities, and necessitates fewer applications.

Transmissible lysins preventing or modifying bacterial growth have been found in decaying organic matter, as well as in extracts of viable seeds. Little doubt remains regarding the identity of the lytic factors, whatever their source, and the indications are that they may arise from an interaction between the bacterium and the invaded host tissue. If this can be proved, it will facilitate understanding of the mechanism of disease resistance in plants.

Verticillium wilt of chrysanthemums [ibid., xviii, p. 783; xx, p. 118] is becoming widespread and serious in Ohio, and certain very good varieties, such as those in the Seidowitz group, have fallen out of favour because of their susceptibility. Only healthy plants should be used for propagation. It is difficult to detect affected plants of some varieties in spring when cuttings are made, the symptoms being most obvious in the autumn at blossoming time, at which period roguing should be effected and only healthy plants retained for propagation. The number of infected plants has been reduced from 90 to under 20 per cent. in some varieties in a single season by this method. Of 300 varieties tested, 35 per cent. were resistant.

Careful pruning and application of 10–6–4 fertilizer will usually control *Verticillium* disease of elms and maples [ibid., xviii, p. 281; cf. also xx, p. 39].

HOFER (A. W.). **A characterization of Bacterium radiobacter (Beijerinck and van Delden) Löhnis.**—*J. Bact.*, xli, 2, pp. 193–224, 2 figs., 1941.

In order to clear up as far as possible the confusion surrounding the identity of *Bacterium radiobacter*, especially in regard to its relationship with *Phytomonas* [*Bact.*] *tumefaciens* and P. [*Bact.*] *rhizogenes* [*R.A.M.*, xix, p. 461], the author examined at the New York State Agricultural Experiment Station 51 cultures of the organism, of which three were supplied by the Iowa State College, six by the United States Department of Agriculture, and 42 by the University of Wisconsin.

Bact. radiobacter is indistinguishable by common cultural methods from *Rhizobium meliloti*, *R. trifolii*, *R. leguminosarum*, *R. phaseoli*, *Bact. tumefaciens*, and *Bact. rhizogenes*, but differential reactions occurred on certain media. The following features are peculiar to *Bact. radiobacter*: browning of mannitol-calcium glycerophosphate slants; turbidity of veal infusion broth, accompanied by heavy ring or pellicle production; raised, smooth, glistening colonies, each encircled by a halo, on nitrate glycerol agar; turbidity with pellicle on Clark and Lub's medium; pellicle after eight days at 50° C. on Koser's uric acid medium; good

growth on the ZoBell medium; and tolerance of strong alkalinity (P_H 11 to 12).

The desirability of an amalgamation of *Bact. radiobacter*, *Bact. tumefaciens*, and *Bact. rhizogenes* with the closely allied *Rhizobium* species under observation is briefly discussed.

VAN LANEN (J. M.), BALDWIN (I. L.), & RIKER (A. J.). **Comparisons of crown gall bacteria having normal, attenuated, and restored virulence.**—Abs. in *J. Bact.*, xli, 1, pp. 95–96, 1941.

It has previously been reported that several aliphatic amino-acids containing single amino and carboxyl groups destroyed the virulence of crown gall [*Bacterium tumefaciens*], the criterion of attenuation being the inability to induce galls in tomato stems. In recent studies at the University of Wisconsin cultures removed from amino-acid media immediately after attenuation soon recovered their pathogenicity, whereas those given additional transfers on amino-acid substrata did so slowly, or not at all, some in fact having remained avirulent for over four years, despite various attempts to accelerate the restoration of pathogenicity. This is believed to be the first instance in which a normal host constituent, with a definite formula, has been shown to possess the capacity for attenuation.

FRASER (J. G. C.). **The relative values of seed injured by rust, frost, or drought.**—*Sci. Agric.*, xxi, 6, pp. 307–314, 1941.

Eight lots of the 10 B strain of Marquis wheat, representing eight different kinds of physical properties in the kernels from plump and red, plump and piebald, to frosted, weathered, and rusted [infected by *Puccinia* spp.] were grown for three years in three different localities in Canada. In one area, significant differences were noted between the yield of the plump and red kernels and that of the rusted ones in two years; in the second area the plump and piebald kernels outyielded the rusted and frosted samples by significant differences of 0·3 and 2·8 bush. per acre, respectively; in the third locality, a significant difference resulted only once between plump red and plump piebald as compared with the rusted and frosted samples.

In experiments designed to ascertain the proper rate to sow rusted grain, plump seed and rusted seed were sown at rates of 75, 90, and 105 lb. per acre on farms at Brandon, Indian Head, and Ottawa. Significant differences were only noted at Indian Head in 1938 and at Ottawa in 1937; nevertheless even in tests in which a significant difference was not obtained there was a slight increase in yield as the rates of sowing increased in all the tests.

The data obtained indicate that plump seed is preferable to rusted and generally gives rather higher yields. If rusted seed is used, a much higher rate of sowing becomes necessary. While plump, well-matured, uniform grain of good germination is to be preferred for seed purposes to weathered, badly shrivelled, piebald, frosted, or rusted grain, yet, when germination and pedigree were satisfactory the difference in yield between the poorest and best quality seed in the three areas concerned was in no instance greater than 4·2, 2·6, and 4·7 bush. per acre, respectively.

Philp (J.) & Selim (A. G.). **Rust-resistant Wheats for Egypt.**—*Nature, Lond.*, cxlvii, 3720, p. 209, 1941.

All three wheat rusts [*Puccinia glumarum*, *P. graminis*, and *P. triticina*] are present in Egypt, the greatest loss of yield being produced by black rust [*P. graminis*] on [*Triticum*] *vulgare* wheats in the Nile Delta, where this loss appears to amount to not less than 10 per cent. of the possible yield, or about 2,500,000 bush. yearly. Barberry bushes do not occur in or near Egypt, and wheat plants are so seldom found in summer that they are not likely to carry over the rust. Air-borne spores of *P. graminis* have been found coming from the north-west, and this may, perhaps, be the chief source of infection.

Indian varieties of *T. vulgare* are more suitable for growing under Egyptian conditions than any other imported variety except Mentana; the Egyptian varieties of *T. vulgare*, known as Hindi wheats, are themselves of Indian origin. A moderately resistant *T. vulgare* variety, Mabrook, has been produced from Giza 7 (*T. vulgare*) × Beladi 42 (*T. pyramidale*), which gives about 17 per cent. higher yield than Hindis in the Delta, chiefly because of its seed size and weight.

Some Kenya wheats show promising resistance to *P. graminis* under Egyptian conditions, but are undesirable in other respects. Since 1936 these wheats have been crossed with Egyptian varieties, and some F_4 and F_5 lines have been obtained which are very resistant, high-yielding, and possess other desirable qualities. UX9M1A3 (Kenya) crossed with Giza 7 has given almost completely resistant lines. Giza 7, from Federation × Indian 7, is less susceptible than Hindis, and is the best quality Egyptian wheat. The Kenya parent, which is of unknown hybrid origin, is highly resistant, and has a gene for waxless foliage which is the dominant allelomorph of a gene for waxy, though waxy is generally dominant to waxless in *T. vulgare*. It may, therefore, originate from an interspecific cross, obtaining the dominant waxless and the rust resistance from the tetraploid parent. The evidence suggests that the physiologic races of *P. graminis* in Egypt may prove to be the same as those existing in India.

Alfaro (A.). **Una septoriosis del Trigo.** [A septoriosis of Wheat.]—*Bol. Pat. veg. Ent. agríc., Madr.*, ix, pp. 205–211, 4 figs., 1940.

Since 1936, wheat crops in the province of Saragossa, Spain, are stated to have sustained considerable damage from *Septoria nodorum*. The virulence of the fungus varies to a large extent with the date of onset of infection, early attacks on the nodes and glumes resulting in heavy losses, while a later and more generalized invasion is of little consequence. In one case observed by the writer dense infection by *S. nodorum* was accompanied by the presence of two other parasites, *Leptosphaeria herpotrichoides* and *Wojnowicia graminis*. The fungus grows most luxuriantly on potato agar, though bean, wheat flour, or oatmeal agars may also be used, producing on the first-named at 22° C. circular, radial, white, later olivaceous, filamentous, cottony colonies. A slightly acid (P_H 6·2) reaction of the medium was found to favour growth. Pycnidia were formed most abundantly on wheat flour agar and failed to develop on the bean substratum. Inoculation experiments with aqueous pycnospore suspensions on potted wheat plants gave

positive results. The perfect stage of the organism was not obtained in culture, but among the pycnidia on the glumes, nodes, and leaves of naturally infected plants were encountered a few globose, black perithecia, 70 to 160 by 45 to 120 μ in diameter, furnished with a circular or elliptical ostiole, 22 to 30 μ in diameter, and containing numerous paraphysate, hyaline asci, rounded at the apex, each occupied by biseriate, fusiform, straight to slightly curved, hyaline, vacuolate, uniseptate ascospores, probably representing a species of *Leptosphaeria*, as held by G. F. Weber [*R.A.M.*, ii, p. 212], in opposition to Voglino, who believed the ascigerous form to be a *Sphaerella*. Further experiments are necessary, however, for the definite identification of the perfect stage of *S. nodorum*.

GARRETT (S. D.). **Soil conditions and the take-all disease of Wheat. VI. The effect of plant nutrition upon disease resistance.**—*Ann. appl. Biol.*, xxviii, 1, pp. 14–18, 1941.

In further experiments [the results of which are tabulated] on wheat take-all (*Ophiobolus* [*graminis*]) [*R.A.M.*, xix, p. 525] Red Marvel wheat plants were grown singly in sand culture in glass flower pots under conditions of full nutrient supply, and under deficiencies of nitrogen, phosphate, and potash, and of all three together, respectively. At the end of a month's growth the plants were inoculated with the fungus by the insertion of two pieces of infected wheat straw into the sand on each side of and just below the crown.

Root infection was lightest in the nitrogen-deficient, and heaviest in the potash-deficient, series. Percentage infection of the stem bases was lowest in the full nutrient and nitrogen-deficient plants and highest in the series deficient in all three nutrients. In the uninoculated controls a significant reduction in grain yield was produced only by phosphate deficiency, while in the inoculated plants deficiency of any of the three nutrients significantly reduced grain yield. Infection significantly reduced yield in every series except that given complete nutrients, percentage reduction being highest in the phosphate-deficient series. It is concluded that any nutrient deficiency, if great enough, may increase loss in yield through the disease.

BUDDIN (W.) & GARRETT (S. D.). **Seasonal occurrence of the take-all disease of Wheat.**—*Ann. appl. Biol.*, xxviii, 1, p. 74, 1941.

During 1940 wheat in England, apparently as a result of dry weather, showed little infection by take-all (*Ophiobolus graminis*). In many instances infection was present on the seminal roots and the lower parts of the crown roots, but had failed to progress to the crown. Thus, many wheat crops which appeared to be healthy and showed no white-heads at harvest were carrying infection on the roots. The practice of risking a second crop of wheat after one apparently unaffected by the disease presents danger because a wheat crop that appears to be almost free from take-all at harvest may in reality be carrying sufficient infection on the roots to destroy a following winter wheat crop, if the soil and seasonal conditions favour an attack. One instance of such an occurrence in experimental crops in cages is cited.

Honecker (L.). **Mehltauschäden bei Getreide und ihre Bekämpfung.** [Mildew damage to cereals and its control.]—*Mitt. Landw., Berl.*, lv, pp. 745–747, 1940. [Abs. in *Chem. Zbl.*, cxii (i), 2, p. 263, 1941.]

Summer barley in the neighbourhood of Weihenstephan, Bavaria, is stated to be readily infected by mildew [*Erysiphe graminis*] from winter crops in the vicinity. All environmental factors tending to disturb the balance between water uptake and transpiration of the plants, e.g., drying-out of the soil, sudden rises of temperature, and a habitat copiously enriched with nutrient salts, were found to enhance susceptibility to the disease, which was mitigated, but not effectively combated, by the observance of a rational fertilizing schedule. In the course of breeding experiments covering a 15-year period [*R.A.M.*, xvii, p. 807], a resistant summer variety has been successfully developed, which has already given proof of its superiority in regions where winter barley is extensively cultivated on a commercial scale.

Hayes (H. K.). **Breeding for resistance to crown rust, stem rust, smut, and desirable agronomic characters in crosses between Bond, Avena byzantina, and cultivated varieties of Avena sativa.**—*J. Amer. Soc. Agron.*, xxxiii, 2, pp. 164–173, 1 fig., 1941.

Continuation of investigations at Minnesota [*R.A.M.*, xix, p. 206] showed that it is relatively easy to combine the desirable characteristics of *sativa* oat varieties with the resistance of Bond oats to crown rust [*Puccinia coronata*], stem rust [*P. graminis avenae*], and smut [*Ustilago avenae* and *U. levis*]. Crosses with outstanding qualities of yield, resistance, and absence of lodging were obtained, and tested in thorough statistical field trials.

Rademacher (B.). **Über die Eignung des Mangans in Thomasmehl, Martinschlacke und Hochofenschlacke zur Behebung der Dörrfleckenkrankheit.** [On the suitability of the manganese in basic, Martin, and blast furnace slags for the control of grey speck disease.] —*Bodenk. u. PflErnähr.*, N.F., xix, pp. 166–187, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 22, p. 3088, 1940.]

In pot and field experiments on manganese-deficient soils at the Hohenheim Agricultural College, the assimilability of the manganese extracted from basic, Martin, and blast furnace slags was compared with manganese sulphate for the control of grey speck of oats [*R.A.M.*, xviii, p. 668; xix, p. 302]. The manganese in basic slag was taken up by the plants, but less effectively utilized than manganese sulphate. The element in this form may safely be used on soils tending to produce grey speck, and its efficacy can be increased by the simultaneous application of an acid fertilizer, such as ammonium sulphate. Manganese from the other two types of slag was also assimilated by the plants.

Nilsson (F.). **Rågförsök och Rågförädling vid Sveriges Utsädesförening Västernorrlandsfilial.** [Rye experiments and Rye breeding at the western Norrland branch of the Swedish Seed Association.]—*Sverig. Utsädesfören. Tidskr.*, l, 1, pp. 4–30, 1940.

This is a comprehensive, tabulated survey of a series of experiments, which has now been in progress for many years, on the adaptation of

different rye varieties to the prevailing environmental conditions in Norrland, Sweden, where the problem of winter injury by *Fusarium nivale* [*Calonectria graminicola*], *Typhula borealis* [*R.A.M.*, xvi, p. 802], and *Sclerotinia* [*borealis*: ibid., xviii, p. 298] is stated to be extremely acute. I. Gadd (*Medd. centr. Frökontrollanst., Stockh.*, 14, 1939) questions the existence of any inherent differences in the reaction of rye to *C. graminicola*, the main source of infection by which is believed to be the seed. However, in the writer's tests from 1932 to 1938, inclusive, in which all the seed was treated with uspulun, marked varietal divergences were observed in respect of susceptibility to snow mould, especially in 1935, 1936, and 1938, when the newly developed local Norrland types, the Finnish varieties Halola, Härmä, and Toivo, Sangaste (Estonian), and Alaska proved much more resistant than the southern-bred Improved Vasa I and II, Midsummer, Malmø, Petkus, and others. G. I. Tornquist's observations at Luleå in 1938 (*Sverig. Utsädesfören. Tidskr.*, xlix, 1939) also revealed marked varietal differences in the reaction of rye to the three above-mentioned fungi, of which *T. borealis* appears to have been the most harmful. Here again the varieties of southern origin, with their relatively poor vitality, failed to withstand disease as well as the hardier northern types.

Tzereteli (L. Y.) & Tchanturia (N. N.). Фитофтороз цитрусовых плодов. [*Phytophthora* on Citrus fruits.]—*Sovetsk. Subtrop.*, *1940*, 9, p. 44, 1940.

Brown rot of citrus, caused by *Phytophthora* sp. [*R.A.M.*, xviii, p. 671], first noticed in the Georgian S.S.R. in 1936, is stated to have been almost universally present in plantations of Abkhazia and Adzharia by 1939, inducing fruit drop in lemons, oranges, tangerines, grapefruit, and citrons.

Gogvadze (I. I.). Ветрозащитные полосы в борьбе с цитрусбластом. [Wind-breaks in the control of Citrus blast.]—*Sovetsk. Subtrop.*, *1940*, 9, p. 57, 1940.

Observations on citrus blast (*Bacterium* [*Pseudomonas*] *citriputeale*) [*R.A.M.*, xviii, p. 671] on the Tzikhis-Dzir, Akhalshensk, and Makhin-Dzhaur State farms, where 20,000 to 25,000 out of a total of 200,000 trees were affected, showed that all the diseased trees grew on sites unprotected from winds. In tests conducted in 1939 seven trees in a plantation of 1,221 were either wrapped in gauze or partially screened from wind leaving the top of the tree exposed. In the following spring all unprotected trees were found to have diseased twigs (on an average 45 to 95 twigs per tree), whereas the wrapped trees were entirely free from disease, and the screened trees had diseased twigs only in their exposed crown. It is concluded from these results that wind-breaks are an effective means of controlling blast and should be introduced into all citrus plantations.

Van Der Plank (J. E.) & Van Niekerk (O. T.). **Notes on the bleaching of sooty blotch from Oranges.**—*Citrus Grower*, *1940*, 83, pp. 1, 3, 1940.

The information presented in this note on the substitution of calcium

hypochlorite for a mixture of bleaching powder and sodium bicarbonate for the removal of sooty blotch (*Gloeodes pomigena*) from oranges in South Africa has already been noticed from another source [*R.A.M.*, xx, p. 200].

Roy (W. R.) & Bahrt (G. M.). **The effect of zinc, iron, manganese and magnesium, applied to frenched and bronzed Orange groves, on the vitamin C content of Oranges.**—*Proc. Fla hort. Soc.*, liii, pp. 34–38, 1940. [Abs. in *Chem. Abstr.*, xxxv, 4, p. 1168, 1941.]

The juice of oranges from 'frenched' and 'bronzed' [*R.A.M.*, xvii, pp. 520, 672] trees in Florida yielded a subnormal amount of ascorbic acid, but following the incorporation with the soil of zinc in the first instance and manganese in the second, the vitamin C content of the fruit gradually rose to its normal level. Similar applications of these and other elements to healthy trees failed to produce any comparable increase in the ascorbic acid content of the oranges.

Halma (F. F.). **Bud-shoot wilt of Citrus nursery trees.**—*Calif. Citrogr.*, xxvi, 4, pp. 86, 106–107, 2 figs., 1941.

In 1930 the author's attention was drawn to a citrus nursery in Ventura county, California, in which about 20 per cent. of the young bud shoots wilted and died. The nursery consisted of lemon and Valencia orange budded on sweet and sour orange rootstock seedlings, and the Valencia bud shoots were affected to a much greater extent than the lemon. The majority of the affected shoots were under 6 in. in length. In some cases a new sprout took the place of the wilted one. Sometimes two shoots growing out simultaneously wilted, sprouts appearing at or near the base of the original shoot. On shoots over 6 in. long and on those whose basal portion was partly mature the wilt was confined to the upper growing part, which in time became replaced by lateral roots.

Observations on some 2,300 budded Valencia oranges showed that about 85 per cent. of the wilt that later developed occurred on shoots 6 in. or less in length. Nearly all produced a second sprout which did not wilt. No shoot over 18 in. long was affected. The percentage of total wilt was nearly twice as high for one budder as for another. Very little wilt occurred on buds tied with string but the percentage of dead buds was high. Other observations showed that sudden rises in temperature and probably desiccating winds were important factors conducing to the condition, which is more prevalent under arid interior than under coastal conditions.

It is assumed that wilt is entirely physiological in origin. In the case of inserted buds incomplete union of bud and rootstock tissues apparently prevents enough water from reaching the sprout to sustain it during sudden hot, dry spells, this view being supported by the fact that watersprouts on the rootstock stub do not wilt.

Turrell (F. M.), Sinclair (W. B.), & Bliss (D. E.). **Structural and chemical factors in relation to fungus spoilage of Dates.**—*Rep. Date Grs' Inst., 1940*, pp. 5–11, 4 figs., 4 graphs, 1940.

Fruit spoilage [*R.A.M.*, xviii, p. 104], in which at least 20 species of

fungi and several forms of yeasts and bacteria are involved, is stated to be the most important group of date diseases in California. Unusually heavy losses of dates from this source, amounting to a reduction in tonnage from about 11,000,000 lb. to less than 4,000,000, have occurred in the Coachella Valley in 1939 as the result of two heavy rainstorms. It is estimated that roughly half the loss was caused by water injury and the other half by fungous decay. All the fungi known to cause spoilage in dates usually enter the rind of the fruits through ruptures caused by water injury, but are capable under favourable conditions of penetrating unwounded fruit surfaces. The present preliminary paper gives the results of a study of the problem begun in 1931 and is confined to a discussion of the two most important agents of spoilage, *Aspergillus niger* causing calyx-end rot, and *Alternaria* sp. (similar to *A. citri*) causing side spot decay on the Deglet Noor variety. The period of susceptibility of the dates to fungous attack falls mostly within the 'khalal' (turgid and red) and 'rutab' (partially softened to completely softened and reddish to brownish) stages of maturity, during which the moisture and sugar concentrations appear to be favourable to fungous growth; the preceding and following stages, 'kimri' (turgid and green) and 'tamar' (softened, brownish, and cured to a point where the fruit will keep), respectively, seemed unsuited for the development of the organisms concerned. An investigation of the causes preventing infection by the fungi in these stages of maturity shows that the fruit is provided with both structural and chemical types of protective mechanisms. In the case of calyx-end rot, *Aspergillus niger* attacks the unwounded fruit in the region of the calyx where the cuticle is absent and the outer epidermal wall not yet thickened, but is unable to penetrate the unwounded surface anywhere else owing to the presence of thickened cuticle and epiderm. The fungus made fair to good growth on media containing digallic acid, indicating that this type of tannin is not important in protecting date fruits from *A. niger*.

Alternaria sp. will attack wounded dates in the 'khalal' and 'rutab' stages, but direct penetration of unwounded fruits occurs only in the latter, the lesions, when first visible, being usually situated in the turgid, unripened portion of the fruit in any region between the tip and the calyx, but within a short distance of the advancing margin of the translucent tissue. The *Alternaria* is capable of penetrating the cuticle and fully differentiated epiderm, but in the 'rutab' stage of maturity there is a decrease in the concentration of tannin-like substances in the epiderm and hypoderm, which is correlated with loss of resistance to the fungus. In experiments with true tannin mycelial growth was markedly inhibited by digallic acid at a concentration of 1·25 per cent., and entirely arrested at one of 5 per cent. The protective mechanism here involved seems therefore to be chemical in nature. The resistance of dates in the 'tamar' stage to fungi in general is thought to be due to high osmotic pressure in the presence of an abundance of sugar in the sap of ripe fruit.

Bliss (D. E.) & Bream (R. O.). **Aeration as a factor in reducing fruit spoilage in Dates.**—*Rep. Date Grs' Inst., 1940*, pp. 11–15, 2 figs., 1940.

Further field experiments on the fruit spoilage of dates in California

[see preceding abstract], conducted during 1938–9 on 12- to 13-year-old Deglet Noor palms, confirmed previous conclusions that aeration is beneficial, especially during years with rainfall and high relative humidity during the period of maturity. The experimental bunches being all reduced to approximately the same size by thinning, wire rings were inserted into some of them at the late 'kimri' (green) stage of maturity, spreading the fruit strands apart so as to produce a circular opening of about 8 in. diameter in the centre of the fruit bunch. All bunches were covered with heavy, unwaxed, crepe paper bags, of which some were unbroken and others perforated with irregular holes. The fruit-ripening season in 1938 was practically free from rain, while that of 1939 was one of the wettest yet recorded, and consequently the loss from fruit spoilage in 1939 was at least 10 times greater than that in 1938. In both years bunches with wire rings had the least water injury while the unaerated bunches had the most. Black nose [*R.A.M.*, xviii, p. 104] ranged in 1938 from 1·1 per cent. in aerated to 5·5 per cent. in unaerated bunches, and in 1939 from between 1·7 to 2·5 per cent. in the former to between 4·6 to 7·2 per cent. in the latter. The small amount of fungous decay in 1938 was limited almost entirely to calyx-end rot caused by *Aspergillus* [*niger*] and *Penicillium*; in 1939 side spot decay due to *Alternaria* was very common and probably as destructive as calyx-end rot.

Admitting the beneficial effects of aeration, it is nevertheless concluded that the methods of controlling fruit spoilage in dates are still unsatisfactory. Perforation of the bags may be undesirable, as bunches in perforated bags seemed wetter than those in regular ones. The manufacture of wire rings is discussed and a machine for making crimped wire described. With experience in handling the wire, it is said to be possible to reduce the cost to less than 0·5 cent per ring.

KLEIN (A. V.). **La enfermedad del Café en el Oriente.** [The Coffee disease in the east.] *Rev. agríc., Guatemala*, xvii, 10, p. 319, 1940.

Coffee in the vicinity of Lake Pino, Guatemala, is stated to suffer from a root rot and wilt caused by a Myxomycete, with a 'myxoflagellate' phase [cf. *Phytomonas leptovasorum*: *R.A.M.*, xiii, p. 28]. The pathogen migrates from the soil through the capillary roots into the interior of the conducting vessels and companion cells, destroying the cell walls. Within the cells of the woody portion of the root, the fungus is transformed into the 'myxamoeba' stage, in which further multiplication is effected by division. The passage of the parasite is obstructed and the organism being unable to thrive under these conditions, undergoes a further metamorphosis through the confluence of groups of myxamoebae into plasmodia, which become encysted and return by way of the slender roots to the soil, whence they are conveyed by various agencies, such as wind, water, insects, implements, and labourers, to healthy plants. Control measures should include the disinfection of the soil, for a distance of 2 m. round each eradicated bush, with 5 per cent. copper sulphate, and the use for propagation of grafts from bushes that have recovered from the disease and thus acquired immunity from future attacks.

KRUG (H.). **Cafés duros. I. II. Um estudo sôbre a qualidade dos Cafés de varrição. III. Relação entre procentagem de microorganismos e qualidade do Café.** [Hard Coffee berries. I. II. A study on the quality of fallen Coffee berries. III. Relation between the percentage of micro-organisms and the quality of the Coffee.]—*Rev. Inst. Café, S. Paulo*, xv, 159, pp. 636–638; 163, pp. 1393–1396; 165, pp. 1827–1831, 2 graphs, 1940. [English summaries of parts II and III.]

Coffee berries in São Paulo, Brazil, are harvested only once in the season, when ripe berries are plucked from the bushes, and those which have already fallen to the ground are also collected. The present study is concerned with the effect of micro-organisms on the flavour and quality of berries which were found to deteriorate progressively with the length of the time during which they have been lying on the ground, especially when showers fall on the drying product. *Fusarium concolor* was the fungus most frequently isolated from low-grade samples with a so-called 'hard' or 'Rio' taste, though others, as yet unidentified, were also implicated: in four lots with averages of 9·3, 23·4, 44·8, and 54·5 per cent. fungal infection, the average incidence of *F. concolor* was 3·4, 11·0, 23·0, and 34·5 per cent., respectively.

UPPAL (B. N.), KULKARNI (Y. S). & RANADIVE (J. D.). **Further studies in breeding for wilt resistance in Cotton. I. Isolation of wilt-resistant types. II. A preliminary note on the genetics of wilt resistance in Indian Cottons.**—*Proc. second Conf. sci. Res. Wkrs Cott. India*, 31 pp., [? 1940].

The fully tabulated data from experiments at Poona covering a wide range of cotton (*Gossypium herbaceum* and *G. arboreum* var. *neglectum*) strains show that continuous selfing and selection for resistance to wilt [*Fusarium vasinfectum*: *R.A.M.*, xix, p. 15] over a period of three to four years under conditions of infection approaching the optimum culminate in the development of types fully resistant (complete absence of leaf mottle) to the disease, the homozygous condition being reached more rapidly in some lines than in others. The attainment of full resistance in the strains and segregates of the B.D. 8 crosses, for instance, having been achieved by stages, is assumed to be attributable to the gradual elimination of minor modifying factors, a result easily accomplished in the specially chosen conditions of pot culture but difficult to effect in the field. It is emphasized, however, that field selection remains the only practicable method of 'building up' resistant types as a preliminary to their selection in pot culture under controlled glasshouse conditions. A number of Million Dollar cultures, having been entirely wilt-free during the last three seasons, may also now be classed as 100 per cent. resistant.

Evidence of monohybrid segregation for wilt resistance was secured in the F_2 generation of K.F. × 1027 A.L.F., whereas in crosses between Dhulia 2 and (1) Chinese R_1 spotless 51 and (2) New Million Dollar, this character was found to be governed by three complementary factors.

TALLEY (P. J.) & BLANK (L. M.). **A critical study of the nutritional requirements of Phymatotrichum omnivorum.**—*Plant Physiol.*, xvi, 1, pp. 1–18, 3 graphs, 1941.

A study of the nutritional requirements of *Phymatotrichum omnivorum*

in synthetic solutions showed that a proper balance between dibasic potassium phosphate and magnesium sulphate was as important as the direct effect of either salt. When such a balance was maintained, the concentrations of both could be decreased by 50 or increased by 400 per cent. without significant change in growth rate. In this balance the potassium ion was more important than the phosphate radical. The chloride ion was either inessential or was provided in adequate amounts as impurities in the reagents. There was no significantly superior combination of salts for the supply of the inorganic nutrients, the range of tolerance for the major essential ions being wide. A solution containing 0·008 M dibasic potassium phosphate, 0·003 M magnesium sulphate, 0·002 M potassium chloride, and 2 p.p.m. of iron, manganese, and zinc was not significantly improved by increasing or decreasing the concentration of any one of these salts or their ions. This solution is well balanced, and the amount of growth on it was governed by the nitrogen supply or the available carbon.

Growth rate increased with supply of ammonium nitrate over a certain range only, beyond which the growth increment rapidly fell. With very high concentrations of ammonium nitrate the responses to the different concentrations of dibasic potassium phosphate and magnesium sulphate were irregular. The greater growth rate given with higher concentrations of nitrogen did not increase the efficiency of carbon utilization. If glucose (the carbon source) is not a limiting factor, growth rate may be regulated by nitrogen supply, but if it is, little is gained by increasing the nitrogen supply. Increase in the carbon supply increased the amount of growth but reduced the apparent efficiency of carbon utilization.

Goetsch (W.) & Grüger (R.). **Die Pilze der Blattschneider-Ameisen und ihre Vernichtung.** [The fungi of leaf-mining ants and their destruction.]—*Naturwissenschaften*, xxviii, 49, pp. 764–765, 1940.

In a recent communication (*Biol. Zbl.*, xl, 1940) the first-named author (with R. Stoppel) reported the consistent isolation from the 'fungus gardens' of the Brazilian leaf-mining ant, *Atta sexdens*, of *Hypomyces ipomoeae* and *Fusarium* spp., while those of *Acromyrmex striatus* in Patagonia yielded closely related forms. In laboratory experiments at the Breslau Zoological Institute these organisms were presented to the insects, which utilized them repeatedly for the construction of new gardens, but only when accompanied by other fungi (especially *Mucor* spp.), as under natural conditions. In the meantime the Patagonian ants have further been induced to make use of *Hypomyces* spp. occurring on *Boletus* spp. in Silesia, again in conjunction with *Mucor*, so that the provision of specifically South American strains is evidently unnecessary. The addition of sugar juices to the fungal mycelium was found to increase the size of the broods produced by the ants. The *Hypomyces* and *Fusarium* spp. under observation throve best in the saliva secreted by the ants in the act of chewing the leaves, which was toxic, however, to ordinary moulds. The writers have now accomplished their object of breeding fungi antagonistic to the ant symbionts, which are overrun and destroyed by such fungi both in their natural habitat and in agar cultures. Furthermore, the insects

themselves conveyed the spores of the antagonistic fungi, strewn along the approaches to the nests, into the interior, where both the ants and their fungal symbionts perished in a few days.

CONANT (N. F.). **The taxonomy of the anascosporous yeast-like fungi.**—*Mycopathologia*, ii, 4, pp. 253–266, 1940. [Received April, 1941.]

In the first part of this paper, a preliminary account of which has already been noticed [*R.A.M.*, xix, p. 555], the author briefly reviews the results [as yet unpublished] obtained by Martin and Jones from a study of 461 strains [including the 153 already reported on: ibid., xvi, p. 811] of anascosporogenous yeasts. Langeron and Guerra [ibid., xviii, p. 253] recognized 16 species of *Candida*. Martin and Jones, who prefer to use the generic name *Monilia* reduce six of these to synonymy and regard *C. pelliculosa*, *C. zeylanoides*, *C. deformans*, and *C. suaveolens* as doubtful, thus leaving the following: *C. albicans* (syn. *C. triadis*, *C. aldoi*), *C. parakrusei* (syn. *C. chalmersi*, *C. lodderi*, *C. brumpti*, *C. flareri*), *C. parapsilosis*, *C. krusei*, *C. tropicalis* (*C. intermedia* [see also below]), *C. pseudotropicalis* (syn. *C. mortifera*), *C. stellatoidea*, and *C. guilliermondi*.

In the taxonomic discussion which follows it is pointed out that the synonymy of *M. candida* Bon. 1851 follows two courses: first, *M. candida* Bon. of Plaut 1887 equals *M. bonordenii* of Vuillemin 1911 equals *Candida albicans* of Berkhout 1923 and of Langeron and Guerra 1938 equals *Mycotorula albicans* of Ciferri, Redaelli, and Cavallero 1938; and second, *Monilia candida* Bon. of Hansen 1888 equals *Monilia tropicalis* of Castellani 1913 equals *Candida vulgaris* of Berkhout 1923 equals *Candida tropicalis* of Berkhout 1923.

The opinion that the yeast-like *M. candida* Bon. of Hansen, renamed *C. vulgaris* by Berkhout was identical with the original *M. candida* Bon. 1851 caused this fungus to become the type species of *Candida*, as it antedated *M. albicans* (Robin 1853) Zopf 1890. It is thought to be improbable, however, that any yeast-like fungus isolated since Bonorden's original description was identical with his *M. candida*. It is also considered very improbable that *M. candida* Bon. 1851 differed from *M. candida* Pers 1797–1822, as Bonorden based his genus *Monilia* on that of Hill-Fries. *M. candida* Bon. 1851 should therefore be regarded as an *Aspergillus* or a *nomen dubium*.

M. albicans (Robin) Zopf 1890 consequently becomes the earliest described species and should be the type of the genus. *M. tropicalis* Cast. 1913 would then replace *C. vulgaris* of Berkhout 1923 and include the following synonyms: *Monilia candida* of Hansen 1888, *Candida tropicalis* Berk. 1923, *Blastodendrion intermedium* Cif. 1929, *Geotrichoides vulgaris* Lang. & Talice 1932, *Candida intermedia* Lang. & Guerra 1938.

In conclusion, the claims of *Syringospora* as the valid name for the genus are again advocated.

MOORE (M.). **The chorio-allantoic membrane of the developing chick as a medium for the cultivation and histopathologic study of pathogenic fungi.**—*Amer. J. Path.*, xvii, 1, pp. 103–120, 3 pl., 1941.

Highly gratifying results have been obtained by the writer at the Barnard Free Skin and Cancer Hospital, St. Louis, Missouri, by the use

of the chorio-allantoic membrane of the developing chick as a culture medium for the following human pathogens [*R.A.M.*, xviii, p. 738], the growth characters of each of which are described in detail: *Malassezia furfur*, *Pityrosporum ovale*, *Trichophyton gypseum*, *Epidermophyton inguinale* [*E. floccosum*], *Achorion schoenleini*, *Microsporon canis*, *Monilia* [*Candida*] *albicans*, *Geotrichum versiforme* Moore, 1934, *Zymonema* [*Endomyces*] *dermatitidis*, *Cryptococcus hominis* or *C. histolyticus* [*Debaryomyces neoformans*], *Coccidioides immitis*, *Sporotrichum schenckii*, *Actinomyces bicolor*, *Monosporium* [*Microsporon*] *apiospermum*, and *Phialophora verrucosa*. The organisms in question made luxuriant growth and in most cases reverted to their parasitic morphology in 5 to 11 days. By this method, which is both less costly and more rapid than that involving the use of laboratory animals, it has been possible to develop lesions simulating those hitherto confined to human subjects.

Livingood (C. S.) & Pillsbury (D. M.). **Ringworm of the scalp. Prolonged observation, family investigation, cultural and immunologic studies in 130 cases.**—*J. invest. Derm.*, iv, 1, pp. 43–57, 2 figs., 1941.

In a series of 130 cases (96 per cent. coloured) of ringworm of the scalp in a small district of Philadelphia *Microsporon audouini* was isolated in 125. Of the investigations reported in this paper it may be mentioned that the examination of giant cultures by fluorescent light proved an extremely valuable adjunct to the standard methods of fungal identification [*R.A.M.*, xvii, p. 175].

Robertson (O. H.), Bigg (E.), Miller (B. F.), & Baker (Zelma). **Sterilization of air by certain glycols employed as aerosols.**—*Science*, N.S., xciii, 2409, pp. 213–214, 1941.

Following up the work of Trillat in France (*Bull. Acad. Méd., Paris*, Sér. 3, cxix, p. 64, 1938), Pulvertaft and Walker in England [*R.A.M.*, xix, p. 152], and others on the germicidal efficiency of liquid aerosols, the writers, at the University of Chicago, tested the action of propylene glycol and certain closely related substances against *Staphylococcus albus* and other micro-organisms. In the case of *S. albus*, one part by weight of propylene glycol in 2,000,000 volumes of air effected complete sterilization of an atmosphere containing up to 200,000 bacteria per cu. l. of air, while the ethylene and trimethylene glycols were of approximately similar efficacy.

Benham (Rhoda W.). **Cultural characteristics of Pityrosporum ovale—a lipophylic fungus. Nutrient and growth requirements.**—*Proc. Soc. exp. Biol., N.Y.*, xlvi, 1, pp. 176–178, 1941.

In further studies on the nutritional requirements of *Pityrosporum ovale* [*R.A.M.*, xix, p. 94], the fungus was found to develop in the presence of inorganic salts (Currie's liquid medium), glucose, and oleic acid (0·01 to 1 per cent.), growth being accelerated and the fungal yield increased by the addition of 0·5 per cent. asparagin. Thiamin and pyridoxin also exerted a stimulatory effect on the organism, but were not essential to its growth under the conditions of these tests.

McMurray (J.). **Some everyday problems in otolaryngology.**—*Penn. med. J.*, xciii, 12, pp. 1690–1692, 1940.

The fungi most commonly associated with otitis in the writer's practice at Washington, Pennsylvania, are *Aspergillus niger* [*R.A.M.*, xix, p. 703], *A. fumigatus*, *Monilia sitophila*, *M.* [*Candida*] *albicans*, and *Penicillium rubrum*, the most reliable therapeutic treatment against which is with a 45 per cent. alcoholic solution of phenylmercuric nitrate.

Klarmann (E. G.), Shternov (V. A.), & Costigan (S. M.). **A method for the evaluation of water-soluble and water-miscible fungicides used in the prevention of the spread of athlete's foot.**—Abs. in *J. Bact.*, xli, 1, p. 37, 1941.

Of the several species of pathogenic fungi associated with the condition known as 'athlete's foot', *Trichophyton rosaceum* [*R.A.M.*, xix, p. 594 *et passim*] shows the highest resistance to phenol. In order to determine the fungicidal efficacy of water-soluble and water-miscible disinfectants, the test organism is grown in Sabouraud's A broth for ten days at 28° C. The mycelial growth is removed by filtration through a 200-mesh, Monel-metal screen, and the spore suspension standardized by means of a haemocytometer. The inoculum for the tests contains 1,500,000 spores per ml., and its phenol resistance is such that it succumbs in ten minutes to a 1:70 concentration, but not to 1:90.

Mallett (E. T.). **Mold mycelia in butter.**—Abs. in *J. Bact.*, xli, 2, p. 271, 1941.

In the course of studies at the Ideal Pure Milk Co., Evansville, Indiana, to determine the relative importance of various factors in regard to the growth of moulds in raw cream and their application to farm conditions, it was found that cream produced with average precautions, cooled to 70° F., and held at that temperature, will keep to a maximum tolerance of four days, determined by the mould mycelium count on the resultant butter [*R.A.M.*, xx, p. 205]. Cream produced under excellent conditions and cooled by atmospheres ranging from 72° to 90° will also keep to a maximum tolerance of four days, while 60 hours is the limit for samples produced in insanitary surroundings. Cream produced under the above-mentioned excellent conditions and cooled to a constant temperature of 45° was still fresh after a fortnight.

Brown (W. H.) & Elliker (P. R.). **Factors affecting the mold content of cream.**—Abs. in *J. Bact.*, xli, 2, pp. 271–272, 1941.

Preliminary trials at Purdue University, Indiana, under conditions simulating those of local farms, indicated that the vigorous stirring of cream twice daily resulted in increased yeast and decreased mould growth [see preceding and next abstracts]. The addition of an active culture of starter prevented mould development for a week in raw cream held at 21° C.

Wildman (J. D.). **Laboratory studies on development of mold in cream.**—*J. Ass. off. agric. Chem., Wash.*, xxiv, 1, pp. 183–190, 1940.

In preliminary experiments the daily over-layering of heavy cream with fresh cream did not result in significant mould (mostly *Oospora*

lactis) at temperatures in the neighbourhood of 30° C. [see preceding abstracts], but when the daily additions were stirred into the previous accumulation extensive contamination occurred. The development of *O. lactis* was restrained, however, by cooling the cream to 20°. The combined effect of temperature and of the relative quantities of inoculum used was found to be important in the evaluation of mould incidence: on the basis of the experiments herein described and tabulated it would appear that for cream accumulated at 20° for a five-day period a mass inoculation is requisite for appreciable mould development, while for samples held at 30° there must be approximately one spore per ml. for substantial growth.

Muskett (A. E.) & Colhoun (J.). **Prevention of stem-break, browning, and seedling blight in the Flax crop.**—*Nature, Lond.*, cxlvii, 3719, pp. 176–177, 1941.

In experiments made in 13 centres throughout Northern Ireland in 1940 flax seedling blight (*Colletotrichum lini*) was almost entirely eliminated by seed treatment with R.D. 7846 [*R.A.M.*, xix, p. 656], and by the short-wet method with ceresan U. 564. Proprietary organomercurial dusts of proved efficacy against *Helminthosporium* disease of oats [*H. avenae*: ibid., xvii, p. 809] also gave good control of *C. lini* when applied at double the rate, i.e., 10 oz. per bush. (56 lb.) of seed. The seed used had 18·2 to 35·7 per cent. infection. The same methods gave encouraging results against stem-break and browning (*Polyspora lini*) [ibid., xix, p. 644], the seedling and stem-break phases being largely eliminated, while the onset of the browning stage was longer delayed in flax from treated seed than in the control. In these tests seed with from 2·8 to 23·7 per cent. infection was used at five centres.

Scutching tests were also carried out on crops grown on replicated plots at the Agricultural Research Institute, Hillsborough. For the stem-break and browning trials a seed sample with 23·7 per cent. infected seed was used, and significant increases in fibre yield of 30 to 60 per cent. were obtained from crops where the seed had been subjected to one or other of the treatments. With seedling blight treatment gave increases in fibre yield of up to 30 per cent.

So far, R.D. 7846 has had no phytocidal effect on the crop, and, apparently, can be used three months before sowing without risk of reducing germinability. Calves and pigeons fed for a considerable period on heavily dressed flax seed showed no ill effects.

Muskett (A. E.) & Malone (J. P.). **The Ulster method for the examination of Flax seed for the presence of seed-borne parasites.**—*Ann. appl. Biol.*, xxviii, 1, pp. 8–13, 1 pl., 1941.

An account is given of an investigation of different methods for the examination of flax seed samples for the presence of *Polyspora lini* and *Colletotrichum lini* [see preceding abstract], in an attempt to devise a rapid and accurate technique for determining percentage infection. Three methods of seed examination for the presence of *P. lini* were tested, namely (1) by placing each seed in a drop of water on a slide, scraping, and examining the water for spores, which was found to be a tedious procedure; (2) examination, after incubation on moistened filter

papers, for acervuli and spores, which proved laborious and otherwise unsatisfactory, and (3) the Ulster method, which was finally adopted for *C. lini* as well. This is as follows. The sample is thoroughly mixed, and the seeds are plated out on 2 per cent. malt extract agar in 9 cm. Petri dishes, ten seeds being spaced equidistantly in each dish. If only a general estimate of the health of the sample is required, 100 seeds are used, but if a more accurate assessment is necessary, 500 seeds are examined. Each seed is transferred to the medium with forceps which are sterilized after plating out each lot of ten seeds, the dishes are incubated at 22° C., and after five days the medium round each seed is examined for fungi. Evidence was obtained that *P. lini* is not spread during the normal operations of handling and mixing seed.

Details of a Danish method were supplied to the authors by Stahl and Kjaer. In this, 400 seeds of each sample are examined through a lens, and every doubtful seed is placed in a drop of 0·1 per cent. water solution of cotton blue for one hour before scraping and microscopic examination for the presence of *P. lini* spores. A comparative test by the authors demonstrated that this method gave less accurate results than the Ulster method. In several instances seed samples, the origin of which was unknown at the time of examination, were correctly determined by the Ulster method as being of Canadian origin, owing to the frequent occurrence of a species of *Alternaria*. The method also enables old and new seed to be distinguished, old samples being comparatively 'clean'.

Kramer (M.). **Os mosaicos da Roseira no Estado de S. Paulo.** [Rose mosaics in the State of S. Paulo.]—*Biologico*, vi, 12, pp. 365–368, 2 pl., 1940.

The form of rose mosaic originally reported in São Paulo, Brazil, by the writer at the first South American Botanical Conference in 1938 and described in *Rev. agric., Rio de J.*, xv, 7–8, pp. 301–311, 1940, is stated to correspond to Thomas and Massey's type 3 in California [*R.A.M.*, xix, p. 409]. It has been found occurring naturally on stocks of *Rosa manetti*, *R.* (?) *multiflora*, *R. canina*, and *R. rugosa*, as well as on a number of commercial varieties, including Black Prince (hybrid tea), white Maman Cochet (tea), Frau Karl Druschki (hybrid perpetua), and Kirsten Poulsen (polyantha).

Another form of the disease, apparently identical with that described by P. Brierley in *Amer. Nurseryman*, July, 1940, under the name of 'yellow mosaic', has also been observed on an unnamed variety (probably a hybrid tea) at the Biological Institute, Rio de Janeiro. Glistening, yellow spots develop in the spaces between the secondary veins and along the margins of the young leaves, and large, elongated, coalescent lesions of the same colour at the tips. On medium-sized leaves the contrast between the mosaic and normal zones is even more striking than on the young foliage, the areas involved by the discoloration being larger and mainly localized along the primary and secondary veins in the form of broad bands, which may diffuse over almost the entire lamina, leaving only a narrow strip of green beside the margin. Vein-clearing is a feature of the disease on older leaves, which may also develop scattered rings of chlorotic tissue with paler centres (the latter sometimes

turning greyish-purple as a result of invasion by secondary micro-organisms), situated at the points of convergence of the secondary and tertiary veins. A further difference between the ordinary and yellow rose mosaics lies in the formation in the latter disorder of elongated, discontinuous, well-marked, yellow lesions extending almost the whole length of the stem.

Control should be based on the selection for grafting purposes of healthy stocks, the reaction of which to mosaic may be tested by the use of scions of 'indicator' varieties, such as Madame Butterfly, Ophelia, and Radiance; stocks giving rise to infection in these should be rejected, while the remainder may be propagated by means of slips. Extreme care should be taken in the choice of scions from cultivated varieties, using only those from absolutely sound plants and thereby avoiding all risk of conveying the virus to stocks which might serve as sources of widespread dissemination.

Atkinson (J. D.). **Die-back of Lacebarks caused by Myxosporium hoheriae n.f.sp.**—*N.Z.J. Sci. Tech.*, A, xxii, 2, pp. 115–120, 3 figs., 1940.

Lacebarks (*Hoheria sexstylosa*, *H. populnea*, and *Plagianthus betulinus*), endemic flowering shrubs [Malvaceae] grown for ornamental or shelter purposes throughout New Zealand, have been found to suffer from a die-back caused by *Myxosporium hoheriae* n.f.sp. [with a Latin diagnosis]. The leaves of infected branches or shoots rapidly wilt and die. Underlying the soft, spongy bark are well-defined, light brown lesions; the diseased wood darkens with age, sometimes turning nearly black. Girdling is frequent, involving the death of all parts above the site of infection. The rupture of the small swellings in the cortex exposes elliptical, salmon-pink acervuli, 2 to 4 by 0·25 to 0·5 mm., usually single but occasionally confluent, and with a hymenial layer, consisting of a compact palisade of filiform, septate, cylindrical, hyaline, straight to curved, unbranched conidiophores, 20 to 100 by 2 to 3 μ, producing at their apices elliptical, unicellular, hyaline conidia, 14 to 23 by 5 to 9 (mean 21 by 7) μ. No perfect stage was observed. The fungus made good growth on potato dextrose agar at 21° C. Inoculation experiments with spore suspensions of *M. hoheriae* gave positive results on wounded seedlings only of the three above-mentioned species.

Gorman (L. W.). **Blind seed disease investigations.**—*N.Z. J. Sci. Tech.*, A, xxii, 2, pp. 79–83, 2 figs., 1940.

An account is given of experiments at the Plant Research Bureau, Palmerston North, New Zealand, on the control of blind seed disease [*Helotium* sp.] of rye grass [*Lolium perenne* and *L. multiflorum*: *R.A.M.*, xx, p. 122] by crop management. To date, the best results have been obtained with early crops (closed up during the last week of October) and those accompanied by a dense growth of a pedigree strain of white clover [*Trifolium repens*], in which the germination of the rye grass exceeded 90 per cent. and a seed yield of up to 47 bush. per acre was secured. Late-planted crops are susceptible both to blind seed and ergot (*Claviceps purpurea*).

Cornelius (D. R.) & Johnston (C. O.). **Differences in plant type and reaction to rust among several collections of Panicum virgatum L.**—*J. Amer. Soc. Agron.*, xxxiii, 2, pp. 115–124, 2 figs., 1941.

Considerable variations in their reactions to rust (*Uromyces graminicola*) were manifested by 34 accessions of the valuable forage grass, *Panicum virgatum*, from different parts of the Great Plains in tests in 1937, 1938, and 1939 at the Soil Conservation Service Nursery, Manhattan. Thus, two of the four Nebraska strains and the one North Dakota collection were extremely susceptible, with average rust percentages of 45·5 in 1937 and 1938 and 51·8 in 1939, whereas those from Oklahoma lowland and southern Texas were highly resistant, with only traces of infection in any of the trials. One upland strain from Oklahoma also combined satisfactory resistance to rust (maximum 4 per cent.) with particularly desirable constitutional characters. The Kansas collections were intermediate in respect of resistance to *U. graminis*, with an average percentage in 1937 and 1938 of 34·9 and in 1939 of 24·1 (one Oklahoma strain included in the figures for the last year).

Hockey (J. F.). **The present orchard disease situation.**—*Rep. N.S. Fruit Grs.' Ass.*, lxxvii, pp. 37–41, 1940. [Received April, 1941.]

During 1940 many complaints were received at Kentville, Nova Scotia, of russeting on Cox's Orange apples, and no solution to this problem has yet been discovered. Iron sulphate-lime sulphur mixture gave less russeting than any other sulphur spray [cf. *R.A.M.*, xviii, p. 532; xix, p. 157].

In a comparative test of the value of lime-sulphur and Bordeaux mixture against scab (*Venturia inaequalis*), one plot of 10-year-old McIntosh apples received Bordeaux mixture (5–15–100) and another lime-sulphur (2 in 100) on 22nd May, this being the first application. A calyx spray of Bordeaux mixture (1–3–100) and lime-sulphur (1½ in 100) was made on 11th June. On 22nd June the plot treated with Bordeaux mixture showed 11·3 per cent. scabbed foliage, and the other 1·6 per cent. On 28th June the former received a cover spray of Bordeaux mixture (3–10–100) and the latter one of lime-sulphur (1½ in 100), lead arsenate being added at the rate of 3 lb. per 100 gals. On 2nd October the lime-sulphur plot gave 86·5 per cent. clean fruit and 7·5 per cent. scab, the corresponding figures for the Bordeaux plot being 64·7 and 21·7 per cent., and for the unsprayed control 20 and 76·8 per cent.

Lime-sulphur should not be used when the temperature or humidity is high. If it is diluted to 1 in 100, the lead arsenate should be correspondingly reduced, a safe rule being to use not more than 2·lb. of lead arsenate to each gal. of lime-sulphur concentrate. Leaves which have grown during sunless days are more susceptible to lime-sulphur injury than leaves which have had a few bright days in which to harden.

Apple trees affected by false sting [ibid., xx, p. 213] should be eradicated, as the fruits never become marketable and grafts cannot be taken from such trees. Mosaic trees should also be removed, as this disease is also transmissible by grafting. A condition referred to as 'flat limb' also occurs on apple trees, especially on Gravenstein but the cause

of the disease has not yet been ascertained. As affected trees are very weak they should be removed.

LEACH (R.). **Banana leaf spot investigations. I. The basis of control.**—*J. Jamaica agric. Soc.*, xliv, 12, pp. 499–502, 1940.

Continuing his paper on the control of banana leaf spot (*Cercospora musae*) [*R.A.M.*, xx, p. 216], the author draws the following conclusions. In Jamaica most leaf-spotting of Gros Michel bananas by *C. musae* originates from infection of the heart leaves. Although some of the heart leaves are, necessarily, not reached, or at least not adequately covered, by the spray, yet spraying has given very good control, the indication being that its action does not altogether depend on its providing a protective covering against infection. The control given by spraying results chiefly from the fact that the operation interferes with spore production and affects the germination of those spores that may reach the unsprayed heart leaf. Damage depends primarily on the intensity of sporulation, which in turn is largely determined by the incidence of dew. Shade, by reducing dew formation, also diminishes spore production, and shade may in time prove to be the most economic means of control in areas where dew formation is not excessive. Appreciable damage from secondary infection on old leaves appears to occur only spasmodically. Injury is cumulative, and plants previously unaffected seldom suddenly develop infection of epidemic proportions. Thorough fortnightly spraying at the commencement of a campaign against leaf spot is advocated in order to make certain that all leaves (particularly each successive, newly affected, leaf) are covered with fungicide when sporulation starts on the spots developing from infection during the heart leaf stage. It may later prove to be possible to keep the disease in check with much less spraying than is at present employed on plantations where good control has already been achieved, but if the spraying cycles are lengthened, careful observations must be made of the amount of spotting on the third to fifth leaves, in order that a decision may be made as to whether spraying can be further deferred. Spray should be applied under pressure directly on the surface of the heart leaf or that of the recently opened leaves. A heavy covering of spray should be applied during dry weather. [This paper is also published as *Bull. Dep. Sci. Agric. Jamaica* 26, 1941.]

WARDLAW (C. W.). **The Banana in Central America. II. The control of Cercospora leaf disease.**—*Nature, Lond.*, cxlvii, 3725, pp. 344–349, 7 figs., 1941.

Banana leaf spot due to *Cercospora musae* [see preceding abstract] was not recorded in the western tropics until 1934, and there is little evidence how it became introduced into this area. Once it had become established in Central America, the economic loss rapidly became grave until it became clear that the industry was faced with the most serious crisis in its history. The data obtained, however, indicated that by spraying in cycles of two to three weeks with copper-containing preparations growers could give their plants a considerable degree of protection. Stationary spraying apparatus was at once installed on an immense scale, including power-houses, large spray-mixing tanks, pumping

units, and an ample pipe-line system through the plantations. A block of 700 to 800 acres was found to make a satisfactory unit for a single spraying project, several such units being necessary for each large banana division. On the Ulua River, Honduras, there is now a continuous area of some 60 sq. miles under permanent pipe-line spray control. In all over 100,000 acres in Central America are now equipped with stationary spray installations.

All the evidence demonstrated that Bordeaux mixture was the most satisfactory fungicide for control purposes. Aeroplane dusting was found expensive and somewhat unreliable, and involved the disadvantage that it must be carried out while dew remains on the leaves, i.e., in the early morning. It may have its place, however, in areas where circumstances do not warrant the installation of permanent equipment. In this connexion it is pointed out that local methods of cultivation render the use of mobile spraying units impracticable. In the system used the pipes are just laid on the ground. A special repair squad is kept constantly at work. The spray is distributed by hoses attached to the delivery pipes, and dragged here and there over a limited area as required. Eight to ten hoses may be in use in one small area, each spray gun being opened and closed several times per minute; any undesirable effects from sudden changes in pressure are overcome by the insertion at intervals of vertical stand pipes (3 in. diameter, 4 ft. high), the air cushions so provided effecting a balance of pressure at the delivery nozzles.

The number of stools requiring spraying may reach 300 to 500 per acre; each is thoroughly wetted from four positions, the jet being directed just below the top of the highest leaves (30 to 40 ft. above the ground). At the high pressures used the spray almost resembles a fog, coverage being surprisingly good and very effective. After each day's work, the pipe-line system is washed out and left full of clean water. Spray residue is removed by dipping the freshly picked bunches in a dilute acid bath, followed by thorough washing in water.

In spite of the expense involved, the results obtained showed considerable profits, and demonstrated that this system of spraying had overcome an epidemic disease which had threatened a major industry with extinction. In fully grown plantations, the control of severe infection is difficult and costly, and takes a long time. The best procedure is to cut down all plants in affected areas and gain control as the young plants come up. Much difficulty was found in securing control in young plantations near badly affected areas, and in some instances control could not be obtained until the severely diseased areas had been cut down. As both adult and young leaves are susceptible, the whole stool should be thoroughly sprayed on each occasion, this process being continued until harvesting. While satisfactory commercial control has now been secured, the costs remain too high, and further research is still called for.

WARDLAW (C. W.). **The Banana in Central America. III. Panama disease.**—*Nature, Lond.*, cxlvii, 3726, pp. 380–381, 1941.

In discussing problems associated with Panama disease (*Fusarium oxysporum cubense*) of bananas with particular reference to the condi-

tions prevailing in Central America and the West Indies [cf. *R.A.M.*, xx, p. 170], the author states that on the lower Ullua River, Honduras, large areas have remained highly productive for some fifty years, with only a negligible amount of infection, in spite of periodic inundations by flood water bringing down debris from infected plantations. On the other hand, areas inland from La Ceiba have become seriously diseased within two years of planting. In these latter localities the evidence suggests a pre-cultivation dispersal of the fungus during the periodic flooding of the forests adjacent to the river, infection having been noted in flooded areas higher up. Many examples have been found of the resistance of old areas and the susceptibility of new. The evidence strongly suggests that conditions on the floor of virgin forests are specially favourable for the propagation and distribution of the causal organism.

In Central America the evidence, both practical and scientific, is that the chief factor in determining the severity of infection is the P_H value of the soil, followed by soil texture.

An experiment is now in progress which consists in flood-fallowing an area of about 100 acres, previously put out of production by the disease. This area has been empoldered and divided into four sections, of which each is to remain submerged for a different period up to 18 months. This investigation is based on the fact that soil fungi require oxygen, and that when highly infected soil had been submerged for one month beneath 2 ft. of water *F. oxysporum cubense* could no longer be found in it. Observations have also shown that in new land built up by the sedimentation of controlled flood water, and hence subjected to several inundations, the incidence of Panama disease was negligible.

Ruehle (G. D.). **Zinc deficiency of the Avocado.**—*Proc. Fla hort. Soc.*, liii, pp. 150–152, 1940. [Abs. in *Chem. Abstr.*, xxxv, 4, p. 1173,1941.]

Mild cases of zinc deficiency in avocado trees in Florida are characterized by chlorosis of the interveinal areas of the leaves, which become progressively smaller, trough-shaped with a recurvate tendency, and yellow to slightly bronzed, especially between the veins. The reduction of twig growth curtails the distance between the leaves and imparts a rosette-like aspect to the foliage. Severely affected old leaves often show many small, dead spots, while the fruit is usually small, with a marked inclination to sunburn and necrotic spotting of the skin. Terminal twigs may die back from a few inches to several feet. Severe cases of zinc deficiency may be corrected by spraying the trees with 10-15-100 zinc sulphate-lime, half the amount sufficing for milder forms of the trouble, which is thought to be associated with the exclusive use of synthetic nitrogenous fertilizers.

Ruehle (G. D.) & Lynch (S. J.). **Copper sulfate as a corrective for die-back, a new disease of the Avocado.** *Proc. Fla hort. Soc.*, liii, pp. 152–154, 1940. [Abs. in *Chem. Abstr.*, xxxv, 4, p. 1173, 1941.]

The older leaves of avocado trees suffering from a new form of die-back in the light sandy soils of the Ridge section of Florida present a dull appearance, the veins becoming prominent at first and then assuming a reddish-brown tinge which may gradually spread into the

leaf blades. The premature shedding of affected foliage may be accompanied by a dying-back of the tips. At an advanced stage of the trouble, multiple buds are formed at the tips of the twigs, sometimes producing a cluster 0·75 in. in diameter, the new leaves put forth by which, however, successively shrivel and die back until the whole twig bearing the adventitious growth is dead. The disease appears to be due to copper deficiency and remediable, in the early stages at any rate, by applications of copper sulphate to the soil.

Ruehle (G. D.). **Spraying experiments for control of Avocado anthracnose.**—*Proc. Fla hort. Soc.*, liii, pp. 155–158, 1940. [Abs. in *Chem. Abstr.*, xxxv, 4, p. 1172, 1941.]

Anthracnose (*Colletotrichum gloeosporioides*) on the blossom spikes and fruit of avocado is stated to be largely controllable in Florida by the timely application of copper fungicides, the first treatment being given when the spikes are well open but before the unfurling of the individual flowers, while one or two additional bloom sprays are necessary to control spike and early fruit infection, followed by at least two during the post-blossom period to combat late attacks on the fruit. Good results have been obtained with 4–4–100 Bordeaux mixture, red copper oxide, and tribasic copper sulphate, both the two latter at 3–100.

Prescott (S. C.) & Dunn (C. G.). **Industrial microbiology.**—x + 541 pp., 28 figs., 19 diags., 13 graphs, New York and London, McGraw-Hill Book Company, Inc., 1940. 35*s*.

Among the sections of mycological interest in this comprehensive treatise on industrial microbiology may be mentioned those dealing with the activities and industrial applications of the yeasts and moulds (the latter including the fermentation of citric and other acids, the uses and products of mould enzyme preparations, and fat production by moulds), and the microbiology of textiles and wood.

Tharp (W. H.), Wadleigh (C. H.), & Barker (H. D.). **Some problems in handling and interpreting plant disease data in complex factorial designs.**—*Phytopathology*, xxxi, 1, pp. 26–48, 2 graphs, 1941.

Frequently, when plant disease data expressed as percentages or some other relative scale of an index system are subjected to the analysis of variance it may be found necessary to transform them to some new scale in order to obtain a valid estimate of the generalized standard error. In this paper the authors discuss the problems of the selection of the proper transformation with particular reference to the case of a factorially designed experiment in Arkansas on the resistance of cotton to wilt (*Fusarium*) [*vasinfectum*: *R.A.M.*, xvii, p. 524].

Ehrlich (J.). **Etiological terminology.**—*Chron. bot.*, vi, 11, pp. 248–249, 1941.

The author recognizes three economically important classes of phytopathological effects: (1) disease, the sustained physiological and resulting structural disturbances of living tissues and organs, ending sometimes in death due to the activity (pathogenesis) of a pathogen; (2) decay, the degradation and disintegration of dead tissue (saprogenesis, saprogen);

and (3) stain, the abnormal coloration of living or dead tissue (chromogenesis, chromogen). In conformity with this terminology he proposes thryptogenesis and thryptogen to replace thryptophytism and thryptophyte [*R.A.M.*, xv, p. 694].

It is suggested that the terms 'inoculation stage', 'incubation stage', and 'infection stage', originally applied by Whetzel to pathogenesis only, be also used to designate the stages of saprogenesis and chromogenesis, and that infection, generally restricted to living suscept tissue, be extended to apply to any organized biotic tissue; infestation and contamination being applied to unorganized media (e.g., agars, soil).

CHUPP (C.). **Diehl's double cover-glass mounts.**—*Chron. bot.*, vi, 10, pp. 226–227, 1941.

This note gives detailed directions for making double cover-glass mounts [*R.A.M.*, xix, p. 486]. It is essential that both the glassware and the glycerine used for mounting shall be free from moisture if cloudiness of the balsam is to be avoided. Any desirable stain can probably be used provided it is compatible with potassium acetate, alcohol, and glycerine.

CROWELL (I. H.). **Use of dichloricide in the control of scavenger mites in test tube cultures.**—*Mycologia*, xxxiii, 1, p. 137, 1941.

Scavenger mites were successfully killed in test-tubes containing cultures of 200 different species of fungi without evident injury to the fungi by exposing the contaminated tubes to the effect of gas from dichloricide crystals. The test-tubes and a watch glass with $\frac{1}{4}$ oz. crystals were left for one hour together under a sealed glass bell jar, and the gas drawn into the tubes by alternately exhausting air and releasing negative pressure. Another successful method was to place a crystal between the cotton wool plug and the wall of the tube, no living mite being observed the following morning.

STEVENS (N. E.). **Botanical research by unfashionable technics.**—*Science*, N.S., xciii, 2408, pp. 172–176, 1941.

In this address to the Section for the Botanical Sciences of the American Association for the Advancement of Science, the author states that his method of calculating disease indices for cereal crops from the amount of matter published on various diseases [*R.A.M.*, xviii, p. 580] has met with a good many amused comments and been considered not very scientific, but that his conclusions, drawn from these calculations, to the effect that disease losses are much higher in self-pollinated crops than in those which are largely cross-pollinated, have not yet been attacked. He defends the value of estimates generally and particularly those of crop losses because of their importance for the recommendation of disease control measures. In general, the point of view is put forward that science is in danger from too much regard for alleged accuracy and methodology and should devote itself more to practical aspects and dare to advance suggestions and opinions of practical value, even though they be based on mere estimates and not supported by measurements.

SELMAN (I. W.). **Control of plant virus diseases by cultural methods.**—*Nature, Lond.*, cxlvii, 3719, pp. 181–182, 1 diag., 1941.

In the light of his studies at the Cheshunt Research Station the author

develops the thesis that virus infection should be regarded as akin to the external environmental factors affecting plant growth and that the symptom expression is determined by the interaction of virus infection and these factors. Changes within the plant induced by a virus can, it is claimed, be counterbalanced by the judicious adjustment of the environmental factors, and the bearing of this on the control of virus diseases is instanced by the helpfulness of assuming that an environmental factor is at fault, in conjunction with the disease itself, when called upon to advise treatment for virus-infected tomato plants.

VALLEAU (W. D.). **The binomial system of nomenclature for plant viruses.**—*Chron. bot.*, vi, 10, pp. 223–224, 1941.

The author briefly reviews and discusses the proposals for virus nomenclature that have been put forward from time to time by various workers [*R.A.M.*, xx, p. 174]. He points out that Holmes's families are based on plant reaction, rather than on virus characteristics, and, further, completely unrelated viruses are placed in a single genus. The scheme greatly simplifies nomenclature, but does not assist classification.

SMITH (K. M.). **Some notes on the relationship of plant viruses with vector and non-vector insects.**—*Parasitology*, xxxiii, 1, pp. 110–116, 2 pl., 1941.

In experiments at the Rockefeller Institute, Princeton, New Jersey, and at the Division of Sugar Plant Investigations, Riverside, California, extracts of the large tobacco 'hornworm' (*Protoparce sexta*) and other caterpillars were shown to inhibit the infectivity of the tobacco mosaic and tobacco necrosis viruses, as judged by the effect on bean (*Phaseolus vulgaris*) plants [*R.A.M.*, xix, p. 556]. The inhibitor was not sedimented after 2½ hours' spinning at 30,000 r.p.m. The potato virus X, tobacco ring spot, and sugar beet curly top viruses were found to be destroyed within the body of *Protoparce sexta*, from the faeces of which the tobacco necrosis virus was twice recovered in very small amounts, while that of tobacco mosaic was uniformly present, though in greatly reduced concentration. The last-named virus can thus be separated from a mixture by passage through the hornworm caterpillar. By the use of the specific insect vector (*Eutettix tenellus*) and artificial feeding methods [*R.A.M.*, xv, 549], the beet curly top virus was recovered 24 hours after injection into the caterpillar's blood, but tobacco mosaic and tobacco necrosis failed to survive under these conditions. Experimental evidence is briefly adduced to prove that the saliva of *E. tenellus* is the actual medium of transmission of the curly top virus.

STANLEY (W. M.). **Some chemical, medical and philosophical aspects of viruses.**—*Science*, N.S., xciii, 2407, pp. 145–151, 1941.

In this paper, read on the occasion of the presentation to the author of the Gold Medal of the American Institute of the City of New York for crystallizing the virus of tobacco mosaic, the history of his own and other workers' research on the isolation of viruses is surveyed and some of the implications of the successes obtained are outlined.

Boswell (J. G.). **The biological decomposition of cellulose.**—*New Phytol.*, xl, 1, pp. 20–33, 1941.

This is a review of investigations on two aspects of the biological decomposition of cellulose, namely, the cellulose activity of germinating seeds, and the activity in the decomposition of cellulose of bacteria and fungi, of which certain moulds and timber-rotting organisms have been most extensively studied [cf. *R.A.M.*, xvii, p. 495]. Evidence has been obtained that in some members of these groups the process of decomposition is facilitated by oxidation, leading to the formation of oxycellulose containing uronic acid molecules.

Efeykin (A. K.). Восстановление южного вырожденного Картофеля в условиях средней полосы СССР. [The regeneration of degenerated Potatoes from the south under conditions of the central zone of the U.S.S.R.]—*Sovetsk. Bot.*, *1940*, 5–6, pp. 242–251, 1 fig., 1 graph, 1940.

Degeneration of potatoes in southern districts of the U.S.S.R. [*R.A.M.*, xix, p. 359] is stated to cause a fall in production of varieties yielding 20 to 30 tons per ha. further north to about 5 to 6 or even 2 to 3 tons after a cultivation period in the south of three to five years. The plants become progressively dwarfed, the stems thin and often curled, the leaves rugose and curled, and the tubers assume abnormal shapes. The precise nature of this disorder remains as yet unknown, although the author suggests that it may be due to the toxic effects of a disturbed metabolism under the influence of high temperatures.

The results of three years' experiments at the Agricultural Institute of Tchuvashia at Tcheboksary [central U.S.S.R.] showed that degenerated potatoes obtained from southern districts recovered gradually and at the end of the experimental period differed neither in yield nor in appearance from plants of the same varieties permanently cultivated under Tchuvashian conditions.

Chamberlain (E. E.). **A masked virus of Aucklander Short-Top Potatoes.**—*N.Z.J. Sci. Tech.*, A, xxii, 2, pp. 57–71, 8 figs., 1940.

In 1935 a severe top necrosis of potatoes first observed at Ashburton and Lincoln, New Zealand, was investigated and found to be transmissible by grafting and juice inoculation, but not by insects, from externally healthy plants of the Aucklander Short-Top variety to Arran Chief, Up-to-Date, President, Epicure, and King Edward, all of which contracted virulent symptoms, including extensive necrosis and collapse of the leaves and stems, and tuber decay (deep-seated in Arran Chief, President, and Epicure, and more or less superficial in Up-to-Date and King Edward). Infected tubers of Arran Chief, Up-to-Date, and Epicure often fail to germinate, and such plants as develop from them are stunted, with foliar spots, yielding poorly, and in the case of Epicure frequently dying prematurely. Inarching proved to be a more effective method of inoculation than core-grafting. The following varieties, grown in proximity to Aucklander Short-Top in selection trials, developed up to 10 per cent. severe infection: Dakota, Arran Chief, King Edward, Up-to-Date, Field-Marshal, and Early Regent, while similar symptoms were observed in commercial crops cultivated

next to Aucklander Short-Top in the previous season. The disease in question is presumably identical with that carried in a masked form by Aucklander Short-Top.

Inoculation experiments with the virus by leaf-rubbing on tomato, Warne tobacco, *Nicotiana rustica*, *N. glauca*, *Petunia hybrida*, and *Datura stramonium* gave uniformly positive results. The primary symptoms (sometimes absent) on tobacco take the form of pale spots surrounded by two concentric rings on the leaves, while secondary features may be either severe, involving pronounced vein-clearing, downward curling of the tips, interveinal necrosis, and stunting, or mild, characterized by faint mottling with little or no effect on the plants. The mild form of infection appears to result from an attenuation of the virus, either through age, heating, or substantial dilution. In *N. glauca* the ring spots may be composed of up to three concentric, light-coloured zones. On *N. rustica* the infected leaves turn pale and show a mosaic mottling in which the darker green areas consist of narrow bands along the veins; necrotic markings and chlorosis develop and finally death ensues. Inoculated tomato leaves show dark brown, almost circular lesions, 1 to 2 mm. in diameter; secondary symptoms appear as a mild mosaic with the dark green areas occurring as bands along the veins. *P. hybrida* foliage infected by the Short-Top virus displays a well-defined mottling, the areas bordering the veins being abnormally dark and the tissues between of a pale colour. In *D. stramonium* the affected leaves also exhibited a well-marked mottling, due to pallor of the main portion of the lamina and a dark green coloration of some of the smaller veins.

The longevity *in vitro* at 22° C. of the Short-Top virus from potato and tobacco was between 21 and 35 and longer than 35 days, respectively. The juice from infected tobacco appears to tolerate dilution to a greater extent than that from potatoes, the former inducing symptoms on all inoculated tobacco plants at a dilution of 1 in 50,000, while the latter infected only one-third at 1 in 10,000. The thermal death point of the virus from both hosts lies between 65° and 70°. It was unable to traverse the 'preliminary', 'regular', or 'fine' grades of Mandler filter candles. The Aucklander Short-Top virus appears to be quite distinct from any of the potato viruses listed by K. M. Smith or described by other writers.

Alten (F.) & Orth (H.). **Untersuchungen über den Aminosäuregehalt und die Anfälligkeit der Kartoffel gegen die Kraut- und Knollenfäule (Phytophthora infestans de By).** [Studies on the amino acid content of the Potato and its susceptibility to plant and tuber blight (*Phytophthora infestans* de By).]—*Phytopath. Z.*, xiii, pp. 243–270, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 21, pp. 2944–2945, 1940.]

The development of *Phytophthora infestans* on potato tubers was shown by experiments at the Lichtenfelde (Berlin) Agricultural Experiment Station to decrease parallel with rising doses of potash, coinciding with a simultaneous decline in the total, protein, non-protein, and α-amino acid nitrogen contents of the tubers and leaves. Early, medium-early, and late varieties likewise showed differences of nitrogen content corresponding to their varying degrees of susceptibility.

Nitrogen-containing substances appear to exert a strong influence on the reaction of potatoes to *P. infestans*. In experiments with α-amino acids sporangial germination was promoted by the majority of the preparations tested, but sulphur-containing compounds and arginin inhibited or killed the sporangia, the lethal action of arginin being little affected by association with stimulatory amino acids. The *dosis toxica* of arginin lies between 0·09 and 0·1 per cent. for a 48-hour treatment, its toxicity being independent of hydrogen-ion concentration. The arginin content of potato tubers and leaves increases progressively with rising doses of potash, and the evidence to date indicates that this substance is a contributory factor in resistance to late blight.

BAWDEN (F. C.). **Problems in breeding for disease resistance.**—*Chron. bot.*, vi, 11, p. 247, 1941.

Referring to Reddick's recent paper [*R.A.M.*, xx, p. 129], in which he questioned the utility of breeding potatoes which, though resistant to blight [*Phytophthora infestans*], were destined to succumb to virus X [ibid., xx, p. 220], the author points out that provided the original blight-resistant seedling is not actually lost, the outlook with a variety that dies when infected is brighter than with a more tolerant one. Viruses are obligate parasites, and in killing their hosts go far to eliminate themselves. In Great Britain, several widely grown potato varieties, e.g., King Edward and Epicure, are killed by virus X, with the result that commercial stocks are seldom contaminated. With more tolerant varieties, however, affected plants remain a source of infection, and the planting of apparently normal tubers perpetuates and increases the virus. Three methods may be followed in breeding against obligate pathogens, i.e., the production of tolerant, immune, or highly intolerant varieties. The first, in addition to the disadvantage indicated above, leads to the production of large reservoirs of infection. With regard to the second, there is small evidence that parents with the necessary genes exist. The third method, however, may confer what amounts to field immunity. Varieties may be so intolerant that the tissues are immediately killed by contact with the pathogen. This phenomenon may prove of great value in the control of tobacco mosaic, as the genes enabling *Nicotiana glutinosa* to localize the virus have been transferred to tobacco. Alternatively, varieties may be systemically hypersensitive, with the result that the whole plant succumbs, and so benefits the rest of the crop. By crossing potato varieties intolerant of one or more of four viruses, the Scottish Society for Research in Plant Breeding has produced Craig's Defiance, which is intolerant of all four, with the result that stocks are virtually immune from them in the field.

DYKSTRA (T. P.). **Results of experiments in control of bacterial ring rot of Potatoes in 1940.**—*Amer. Potato J.*, xviii, 2, pp. 27–55, 1941.

The author has summarized and tabulated the data supplied by workers in various States of the American Union in which experiments in the control of potato ring rot (*Phytomonas sepedonica*) [*Bacterium sepedonicum*] were carried out in 1940. [Some of the work has already been noticed: *R.A.M.*, xx, p. 176.]

Trials in California by J. B. Kendrick and C. E. Scott showed the

cutting knife to be the most effective agent in the spread of the pathogen, the incidence of diseased hills resulting from the cutting of healthy tubers alternately with infected ones being 78, 65, 90, 55, and 56 per cent., respectively, in five tests, an average of 69 per cent. Tuber-unit trials further showed that, once a knife becomes contaminated, the organism may be conveyed as far as the 24th succeeding sound tuber, and that one slightly diseased potato in 25 may result in 90 to 100 per cent. infected hills. Another experiment demonstrated the transmission of *Bact. sepedonicum* by contact between diseased and healthy seed pieces, 138 out of 200 hills (69 per cent.) produced by originally sound pieces shaken up in a bag with diseased ones (1 diseased to 20 healthy) showing ring rot symptoms. When whole tubers were dipped for a moment in an aqueous suspension of ground diseased potatoes, infection developed in 33 per cent. of the resultant hills. The picker-planter (in contrast to the assistant-feed type) proved to be a fruitful source of ring rot spread, the amount of which may be doubled or trebled by its use; in two tests in which healthy seed pieces and small whole tubers were punctured after the implement had been used on diseased material, 64 and 45 per cent. ring rot developed, respectively. In other tests in California the incidence of ring rot was found to be lower on whole seed than on seed pieces, amounting to 16 and 40 per cent., respectively, in one case and to 3 and 9 per cent., respectively, in another. There appears to be little likelihood of *Bact. sepedonicum* overwintering in the soil under Californian conditions, and the same applied, according to J. M. Reader's preliminary tests, to Idaho. 'Volunteer' potato plants, however, may serve to tide the pathogen over from one season to the next, and W. E. Brentzel in North Dakota observed a trace of infection in plants grown in soil used for the overwintering of large stocks of diseased material. The consensus of evidence from the collaborative reports indicates that the spread of the disease under natural field conditions is not an important factor in its perpetuation. The use of apparently healthy seed from contaminated stock is an unwise practice, 10·5 and 4 per cent. infection, respectively, having developed from such tubers in two tests. It is likewise inadvisable to plant seed from fields containing only a trace of the disease, according to H. Darling's experiments in Alabama, where 8, 9, 5, and 2 per cent. infection, respectively, developed in plants from whole seed from areas of limited infestation in four States, the corresponding figures for those produced by seed pieces being 13, 35, 4, and 2 per cent., respectively. Tests by C. J. Eide and R. B. Harvey in Minnesota showed that *Bact. sepedonicum* can persist in a viable condition for 121 days in sacks used for the storage of diseased potatoes.

In Colorado studies were conducted by D. P. Glick and W. A. Kreutzer to determine the relationship between *Bact. sepedonicum* and *Erwinia carotovora*. No rot developed in tubers infected by the former without the latter, and *E. carotovora* alone also failed to cause infection but induced a severe and rapid rot when inoculated into a ring rot-infected tuber.

Details are given of the use of ultra-violet light for the detection of ring rot in various states. In Montana, where this method was first employed by F. J. Harrington and co-workers, the most satisfactory

equipment has been found to consist of a 100-watt, 220-volt, H-4 type black lamp with transformer and Bryant base screw socket, the examination being carried out at temperatures of 40° F. or below in a totally dark room.

Of the various disinfectants tested in a number of States for the treatment of cutting knives, 1 in 1,000 mercuric chloride, with or without acidification, and 1 per cent. iodine were the most effective.

A widespread propaganda campaign against ring rot was conducted in 1940 by the extension services of State agricultural colleges with the co-operation of various publicity agencies.

Tochinai (Y.) & Nakano (T.). **Studies on the nutritional physiology of Piricularia oryzae Cavara.**—*J. Fac. Agric. Hokkaido Univ.*, xliv, 4, pp. 183–229, 1940.

The following formula was found to constitute an appropriate synthetic solution for the culture of *Piricularia oryzae*, the agent of the 'imochi' [blast] disease of rice in Japan [*R.A.M.*, xi, p. 538; xviii, p. 546; xix, p. 673, *et passim*]: 2 gm. potasium nitrate, 0·5 gm. each of monopotassium and dipotassium phosphates and magnesium sulphate, 0·1 gm. calcium chloride, a trace of ferric chloride, 30 gm. sucrose, and 1,000 c.c. redistilled water. The fungus appeared to be able to utilize carbohydrates and higher alcohols as the carbon source, notably maltose, soluble starch, glucose, glycerine, and mannite (in the order named), while the best source of nitrogen was peptone, followed by sodium nitrate, asparagin, glutamic acid, and acetamide. *P. oryzae* further made slight vegetative growth in nutrient solutions containing 0·125 per cent. sodium or potassium nitrite, usually regarded as antagonistic to fungal development. No growth occurred, however, at concentrations of 0·25 per cent. A stimulus to growth was afforded by concentrations of ferric chloride below $\frac{1}{2,000}$ mol. and of copper sulphate under $\frac{1}{60,000}$ mol., whereas at higher strengths these compounds tended to retard development, and at $\frac{1}{1,600}$ and $\frac{1}{1,000}$ mol., respectively, inhibition was complete.

Chandler (W. V.) & Scarseth (G. D.). **Iron starvation as affected by over-phosphating and sulfur treatment on Houston and Sumter clay soils.**—*J. Amer. Soc. Agron.*, xxxiii, 2, pp. 93–104, 4 graphs, 1941.

In tests at the Alabama Agricultural Experiment Station the application of superphosphate in varying amounts up to 6,400 lb. per acre to Houston (P_H 7·78) and Sumter (highly calcareous) clay soils in 1-gal. pots induced iron chlorosis in groundnuts in both cases, the disturbance being particularly severe in the latter series. The chlorotic symptoms were counteracted by the incorporation with the soil of elemental sulphur at the rate of up to 8 tons per acre, the treatment being more effective on Sumter than on Houston clay. Lucerne did not suffer from chlorosis as a result of the superphosphate applications. The data obtained from chemical analyses suggested that a substantial proportion of the available iron in the soil may be assimilated by the groundnuts in such a way as to afford no protection against chlorosis.

Matsumoto (T.) & Hirane (S.). **On the causal organism of a bacterial soft rot of Poppy in Formosa.**—*Trans. nat. Hist. Soc. Formosa*, xxxi, 208, pp. 1–13, 4 figs., 1941. [Japanese, with English summary.]

Opium poppies [*Papaver somniferum*] in Formosa were observed in the spring of 1940 to be infected by a disease which attacked the stem at or just above soil surface, or at the base of the petiole of young plants. The infection was accompanied by soft rot and internal disintegration. On adult plants, the affected part showed external discoloration and internal disintegration accompanied by a slimy exudation and stem-breaking at this point. The organism isolated from infected material was either identical with or closely related to *Bacillus* [*Erwinia*] *aroideae*, and corresponded in its general characters with the isolate of this species from radish [*R.A.M.*, xx, p. 9], though the two organisms were quite different serologically and bacteriophagically. The poppy organism did not agglutinate even at a serum concentration of 1 in 10 when tested against the antiserum of the radish organism, but was agglutinable in the homologous serum in all the dilutions up to 1 in 25,600. The radish organism was inagglutinable in the antiserum of the poppy organism. Further, the poppy organism was quite insensitive to the bacteriophage from rotten radishes. The authors hesitate to conclude that the poppy organism is entirely identical with that obtained from radish, but tentatively identify both with *E. aroideae*.

Carpenter (C. W.). **A Chytrid in relation to chlorotic streak disease of Sugar Cane.**—*Hawaii. Plant. Rec.*, xliv, 1, pp. 19–33, 12 figs., 1940.

Following a summary of previous investigations on chlorotic streak disease of sugar-cane [*R.A.M.*, xx, p. 178], the writer describes his current studies on the disorder in Hawaii, where latent infection is stated to be widespread and liable to cause appreciable damage in a symptomless form. In fact, the failure of P.O.J. 36 to maintain its early promise as a prolific yielder is attributed in well-informed circles largely to this factor, losses from which in susceptible varieties have been estimated by J. P. Martin and Conant at 15 to 20 per cent.

Among the numerous organisms cultured from the tissues of diseased plants is a Chytrid with *Chondrioderma*-like amoeboid stages which apparently only grew in association with bacteria. In the affected tissues a Chytrid occurred in the form of small and subhyaline, slightly larger, grey, or large brown to black, opaque spheres (sporangia), 5 to 60μ in diameter, but its relationship to the fungus isolated has not yet been demonstrated. In addition other spherical, hyaline bodies, 3 to 25μ in diameter, were observed in the tissues, the larger ones (? hypnospores) having thick walls and being generally reminiscent of the spherical spores of the fungus obtained in culture from dry leaf sheaths of infected canes. Associated with the dark-coloured sporangia in the parenchyma cells of the stalks are rounded protoplasmic bodies, 5μ in diameter, disposed along a scarcely discernible strand of the fungus on the inner surface of the host cell wall in a manner suggestive of the turbinate bodies and habit of a species of *Physoderma*. It is impossible at the present juncture to interpret the various phases in the life-cycle

of the Chytrid, but the dark-coloured sporangia apparently prepare for germination by the development of a gelatinous cap, while later many oil drops and vacuoles of varying size are formed, or the contents may emerge as minute, spherical (?) sporangia, or again as a thallus-like outgrowth. This plasmodium-like material further occurs in the shape of irregular units and small spheres in the stalk cells, similar elements also being found among the foliar chloroplasts and in the rudimentary leaves of the cane bud.

The organism under discussion has most frequently been detected in the parenchyma both above and below the nodes, near the centre of the externally sound stalks as well as close to the rind. The xylem and phloem may occasionally be invaded, but the parenchyma and storage tissue seem to be preferred. The fungus occurs just below the epidermal cells of the rind, and portions of the plasmodium-like thallus have been observed in juxtaposition within and outside the rind immediately above the bud, clearly denoting a point of entrance or exit of the pathogen. In the leaves the parenchyma and chlorophyll-bearing cells are similarly involved. The yellow or red gum deposits in the conducting vessels, particularly of the nodes, as well as in the leaf xylem, appear to be a product of the host rather than an accumulation of extraneous organisms, but their exact relationship to the leaf streaking typical of the disease is still obscure.

Attention is drawn to some striking analogies between chlorotic streak of sugar-cane and the course of *P. zeae-maydis* [*P. maydis*] in the maize plant, not necessarily entailing a taxonomic affinity.

L. (H. M.). **Downy mildew of Sugar Cane.**—*Int. Sug. J.*, xliii, 507, pp. 80-81, 1941.

Following a general statement regarding the present position of sugar-cane downy mildew [*Sclerospora sacchari*] in Queensland [*R.A.M.*, xx, p. 230], the writer summarizes a recent paper by N. J. King (*Cane Grs' quart. Bull., 1940*, 8, p. 29, 1940), describing the work of breeding seedlings at the Bundaberg Experiment Station since the inception of these operations in 1930, at which time the three standard varieties were D. 1135, M. 1900, and Q. 813, and the disease problem was confined to gumming [*Bacterium vasculorum*]. In 1933 P.O.J. 2878 and P.O.J. 213 were released for general distribution, followed the next year by Co. 290, P.O.J. 2725, and P.O.J. 234; among these P.O.J. 2878 is resistant to gumming, but highly susceptible to Fiji disease and downy mildew; P.O.J. 213 is resistant to gumming and Fiji, but very susceptible to mosaic and downy mildew; while P.O.J. 2725 is resistant to all but Fiji disease. During 1938 there was a widespread extension of the last-named and downy mildew throughout the Bundaberg area, necessitating the rejection of a number of promising seedlings of approved agricultural standards and showing adequate resistance to gumming. So far, the nearest approach to the ideal cane is Q. 25, a product of P.O.J. 2875 × H.Q. 409, which is resistant to gumming and downy mildew, though susceptible to mosaic and Fiji. Although the new variety does not yet figure on the approved list, arrangements are in progress for its distribution, under proper safeguards, to local growers.

Arwidsson (T.). **Mykologische Beiträge.** [Mycological contributions.] —*Bot. Notiser, 1940*, 4, pp. 370–388, 1940.

The present instalment (parts 5 to 9) of the writer's mycological contributions comprises annotated observations on a number of Greek Uredineae, some parasitic fungi from Nova Zembla, and, *inter alia*, comments on certain unusual Swedish fungi, including *Puccinia aecidii-leucanthemi* on *Chrysanthemum leucanthemum* and *P. antirrhini* on *Antirrhinum orontium* [*R.A.M.*, xvi, p. 679].

West (E.). **Notes on Florida fungi. II.** —*Mycologia*, xxxiii, 1, pp. 38–49, 2 figs., 1941.

This second list of Florida fungi [cf. *R.A.M.*, xviii, p. 820] contains 30 species, including *Phakopsora zizyphi-vulgaris* found severely attacking *Zizyphus jujuba* [ibid., xvi, p. 279] and less severely *Z. mauritiana*, believed to be the first record of this fungus in America, and *Puccinia cannae* on *Canna indica*.

Maneval (W. E.). **Some recent records of plant pathogens in Missouri.** —*Plant Dis. Reptr Suppl.* 125, pp. 151–164, 1940. [Mimeographed.]

A list is given of 95 plant pathogens (mostly fungi) either detected in Missouri since the compilation of the writer's previous catalogue [*R.A.M.*, xvi, p. 838] or found for the first time on a new host.

Overholts (L. O.). **New species of Polyporaceae.**—*Mycologia*, xxxiii, 1, pp. 90–102, 12 figs., 1941.

This annotated list of ten new species of American Polyporaceae [with English diagnoses only] is based on hitherto unidentified or incorrectly named material.

Yamamoto (W.). **Formosan Meliolineae II, III, IV.**—*Trans. nat. Hist. Soc. Formosa*, xxx, 206–207, pp. 414–425, 35 figs., 1940; xxxi, 208, pp. 14–30, 40 figs.; 209, pp. 47–60, 43 figs., 1941.

The present series of contributions to the knowledge of Formosan Meliolineae [*R.A.M.*, xix, p. 617] comprises 42 species, all but three of which are new and furnished with Latin diagnoses.

Hiratsuka (N.). **Materials for a rust-flora of Riukiu Islands. I.**—*Bot. Mag., Tokyo*, liv, 641, pp. 157–167, 1940.

An annotated list is given of 55 rusts collected by the author in the Riu-kiu Islands, Japan, in the early months of 1940.

Stevens (N. E.). **Host relations in species of Diplodia and similar genera.**—*Mycologia*, xxxiii, 1, pp. 69–73, 1941.

In this paper the author expounds his concept of host relations in species of *Diplodia* and similar genera, which is stated to be diametrically opposed to that of Grove [*R.A.M.*, xvii, p. 68], who lists the species of *Diplodia* on different hosts under different names. Stevens, on the other hand, argues that such fungi are species with a wide host range rather than distinct species and supports his contention with various examples taken from the literature.

Best (R. J.). **Methods for the preparation of pure Tobacco mosaic virus nucleoprotein (Marmor tabaci var. vulgare, Holmes).** *Aust. J. exp. Biol. med. Sci.*, xviii, 4, pp. 401–403, 1940.

In previous papers [*R.A.M.*, xv, p. 404 *et passim*] the author has merely outlined the general principles on which his purified samples of tobacco mosaic have been prepared at the Waite Agricultural Research Institute, Adelaide: in response to increasing interest in the subject, a detailed account of the methods employed is given here.

Kausche (G. A.). **Über eine das Virusprotein inaktivierende Substanz im Samen von Nicotiana tabacum Samsun.** [On a substance inactivating the virus protein in the seed of *Nicotiana tabacum* var. Samson.]—*Biol. Zbl.*, lx, pp. 423–428, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 23, p. 3198, 1940.]

Notwithstanding the fact that tobacco mosaic virus invades the ovaries, the virus was shown by experiments on the Samson variety at the Biological Institute, Dahlem, Berlin, to be non-transmissible by way of the seed, in which an inactivating substance is formed, both in infected and healthy plants, during the processes of ripening and germination. The substance, presumably an amino alcohol, is water-soluble, withstands the action of heat, acid, and lye, and can be precipitated with alcohol from an aqueous solution.

Van der Weij (H. G.). **Desinfectie tegen Tabaksmozaiek.** [Disinfection against Tobacco mosaic.] *Meded. Deli-Proefst.*, Ser. 3, 6, 22 pp., 4 graphs, 1940. [English summary.]

Trisodium phosphate (8 per cent.) plus 4 per cent. copra sodium soap was found to be much the most effective of the various disinfectants tested against the tobacco mosaic virus at the Deli Experiment Station, Sumatra [*R.A.M.*, xviii, p. 765], and frequent washing of the coolies' hands in this solution should prove a valuable adjunct to the control of the disease, though it is emphasized that the timely removal of infected plants as soon as they appear constitutes the first line of defence. The other preparations tested, including 5 per cent. formalin, 0·2 per cent. potassium permanganate, 0·25 per cent. lysol, and 4 per cent. soap, were less effectual; the admixture of soap, however, enhanced the efficacy, not only of trisodium phosphate, as mentioned above, but also of sodium carbonate (the next best compound to trisodium phosphate at a strength of 10 per cent. and upwards) and formalin.

Roelofsen (P. A.). **Verslag van het Deli Proefstation over het jaar 1939.** [Report of the Deli Experiment Station for the year 1939.] —*Meded. Deli-Proefst.*, Ser. 3, 7, 79 pp., 1940.

The following items of phytopathological interest, besides those noticed from other sources, occur in this report [cf. *R.A.M.*, xviii, p. 765], a number of them being contributed by H. G. van der Weij. The average incidence of slime disease [*Bacterium solanacearum*] was 10·8 per cent., compared with 11·6 in the previous year; it is estimated that infection percentages of 10, 20, 30, and 40 per cent. represent reductions of leaf yield of 14, 27, 38, and 48 per cent., respectively.

Out of a total of 553,456 beds, 41,119 (7·4 per cent.) were ploughed up on account of slime disease. The incidence of infection in nine selected lines ranged from 6 to 13·5 per cent. compared with 21 per cent. in the control, and in some, at any rate, of the resistant strains the quality of the product approximates to the commercial standard.

In a series of experiments with various chemical compounds for the control of *Cercospora* [*nicotianae*] in the seed-bed, the best results were obtained with 0·5 per cent. Wacker's new Kupferkalk plus 1 per cent. lead arsenate [ibid., xvi, p. 230], two applications being made weekly, beginning on the 20th day after sowing, and a total of seven treatments given. The incidence of leaf spot in the beds sprayed with this mixture was 18 per cent., compared with 57 per cent. for the control plot receiving lead arsenate only, and 22·5, 21·5, and 22 per cent., respectively, for the three remaining treatments, consisting of 1 per cent. lead arsenate plus 1 per cent. Kupferkalk, 1 and 1·5 per cent. lead arsenate plus copper soap (0·6 per cent. copper sulphate and the same quantity of a 3·6 per cent. solution of copra-sodium soap). Leaf spot in the field and curing barn was effectively combated by the lead arsenate-copper soap treatment, two applications being given weekly, commencing three days after planting out and terminating at heading. At the second plucking test, the percentages of healthy, slightly spotted, and severely infected leaves in the treated plot were 49·7, 34·7, and 15·6, respectively, compared with 26, 41·8, and 32·2 per cent., respectively, in the untreated control plot. After curing, the average number of spots on 56 leaves from the treated plot was $0·39 \pm 0·086$, as against $4·14 \pm 0·39$ on 35 from the control. The practice of sowing seed in separate beds, and transplanting the seedlings at the age of 15 to 20 days to their field sites, widely adopted for convenience in slime disease resistance trials, was found to contribute in no small degree to the development of leaf spot, the direct cause of which was doubtless the interruption of growth consequent on removal. Transplanting is also known to enhance the risk of mosaic infection on soils infested by the virus, and altogether the practice should only be resorted to if absolutely inevitable.

Van der Laan (P. A.). **Motschilduis en Eupatorium als oorzaken van pseudo-mosaiek.** [White fly and *Eupatorium* as causes of pseudo-mosaic.]—*Vlugschr. Deli-Proefst. Medan*, 67, 4 pp., 1940.

In order to confirm the suspicion already entertained as to the agency of white flies (*Bemisia gossypiperda*) in the transmission of pseudo-peh sim-or false mosaic in Sumatra [*R.A.M.*, xviii, p. 765], two tests were conducted in which 200 seedlings were grown under cages and 200 left exposed; at the end of three weeks, not a single plant in the cages was infected, whereas 22 and 5 per cent., respectively, of those outside in the two plots showed symptoms of the disease. In another trial in which 200 plants were grown in an isolated plot and left untouched, 17 per cent. infection developed. Further experiments, in which 20 to 30 per cent. of the young plants placed in contact with diseased weeds in the presence of *B. gossypiperda* contracted false mosaic symptoms, clearly implicated the white fly as the carrier of infection from *Eupatorium odoratum* to tobacco, 6 out of 10 plants

and 4 out of 20 plants developing the disease in two separate tests. Other weeds involved to a lesser extent in the transmission of false mosaic are *Ageratum conyzoides* and *Synedrella nodiflora*, both known to act as reservoirs of 'gilah' infection [loc. cit.]. Every effort should be made to exclude *E. odoratum* from the vicinity of tobacco plantations, which should be surrounded by absolutely weed-free strips 30 m. in width.

Van der Weij (H. G.). **1. Onbetrouwbare bibit en slijmziekte in der aanplant. 2. Kan de slijmziekte zich horizontaal door de grond verspreiden? 3. Nieuwe elementen in de braaklandflora van het Delische Tabaksgebied en hun beteekenis voor het slijmziekte-vraagstuk.** [1. Unreliable seed and slime disease in the crop. 2. Can slime disease spread horizontally through the soil? 3. New elements in the flora of fallow soils in the Deli Tobacco-growing region and their bearing on the slime disease problem.]—*Meded. Deli-Proefst.*, Ser. 3, 10, 25 pp., 5 graphs, 1940. [English summaries.]

In experiments to determine the value of steam sterilization of tobacco seed-beds as a means of combating slime disease (*Pseudomonas* [*Bacterium*] *solanacearum*) [*R.A.M.*, ix, p. 3], the incidence of mortality was compared between two or more of the following groups of apparently healthy seedlings, each comprising 400 to 500 plants in double rows in several replications and consisting of material from (*a*) diseased beds containing a few infected seedlings; (*b*) suspected beds adjacent to diseased ones but harbouring no diseased seedlings; (*c*) healthy beds in sound seed-bed complexes; and (*d*) steam-sterilized beds.

The results were as follows. Externally sound seedlings, originating in infested beds, are liable to severe attacks of slime disease in the field, commencing within 8 to 18 days of transplanting and continuing in some instances until the conclusion of harvesting; 80 per cent. of the mortality arising from this source occurs between the 19th and 43rd day from planting out. Outbreaks of infection on slightly diseased soils within three weeks of transplanting are in all probability attributable to seed-bed contamination. The development of *Bact. solanacearum* on completely healthy plants in heavily infested ground took place within 18 days from transplanting. Further tests, in which half the seedlings from a healthy bed were planted next to sound material and the other half in proximity to diseased seedlings, demonstrated the virtual absence of horizontal dissemination of the pathogen or its passage from plant to plant during an 80-day period. The value of steam sterilization was shown both by the low incidence of infection in seedlings from treated beds (roughly 4 per cent. after two months in the field) and the relative lateness of its appearance (19 to 27 days after transplanting).

In inoculation experiments with *Bact. solanacearum* from various hosts on some of the herbaceous and woody plants developing spontaneously on fallow ground during the minimum period of seven years elapsing between one tobacco crop and the next in the locality under observation, positive results were obtained on *Cynura crepidioides*, *Eupatorium odoratum*, and *Salvia privoides*.

CLAYTON (E. E.), GAINES (J. G.), SHAW (K. J.), SMITH (T. E.), & GRAHAM (T. W.). **Gas treatment for the control of blue mold disease of Tobacco.**—*Leafl. U.S. Dep. Agric.* 209, 8 pp., 2 figs., 1941.

The following recommendations are made for the control of tobacco blue mould [*Peronospora tabacina*] by means of paradichlorbenzene vapour released from crystals scattered on the surface of the regular tobacco cloth stretched 12 to 18 in. above the ground, the beds being covered over with a 60- to 65-thread muslin weighing about 4½ oz. per sq. yd. [*R.A.M.*, xix, p. 733]. No. 6 grade paradichlorbenzene should be used, though a smaller grade is rather more satisfactory in very cool weather, and a larger one during a warm spell. If the muslin cover is dry or somewhat moist 2½ to 3 lb. per 100 sq. yds. of bed should be used, but if it is watersoaked 1½ lb. suffice. Treatment should begin just before sunset (earlier in cool, later in warm, weather) and the beds should be opened at 8 a.m. The first application should be made directly infection is observed in the beds or in neighbouring ones, and should be repeated twice weekly, but not on two consecutive nights, the longest period allowed to elapse between treatments being not over four days. In cold weather three treatments per week should be given. In general, five to ten treatments have been found necessary each season.

MOORE (E. S.). **Control of the kromnek (spotted wilt) disease of Tomatoes.**—*Nature, Lond.*, cxlvii, 3729, pp. 480–481, 1941.

In preliminary trials made in South Africa very promising results in the control of tomato kromnek [*R.A.M.*, xx, p. 150] were given by tartar emetic (1 lb., plus 2 lb. sugar per 100 gals. water), used against the vector *Frankliniella schultzei*. Spraying was begun in the outdoor seed-bed in October, when the plants were in the cotyledonary stage and were already being attacked by the insect, and was repeated at frequent intervals during the next nine weeks. In the neighbouring unsprayed control beds the plants showed the disease when only 4 in. high, and became 100 per cent. infected, growth at once ceasing. In the sprayed beds not more than 5 per cent. of the plants became infected, and an abundant crop was obtained.

ELTINGE (ETHEL T.). **Effect of manganese deficiency upon the histology of Lycopersicum esculentum.**—*Plant Physiol.*, xvi, 1, pp. 189–195, 3 figs., 1941.

A study of the histology and cytology of tomato plants growing in nutrient solution and affected with manganese deficiency showed that the chloroplasts are the first part to become affected. They turn yellow-green, lose their starch grains, become vacuolated, later granular, and finally disintegrate along with the cytoplasm, which turns brown. Affected leaves are thinner and have smaller palisade cells than normal ones; they contain many more cells which show larger masses of crystals than do normal leaves, as do the parenchyma cells similarly. Affected stems are thinner and contain less xylem than normal ones, and often show xylem cells plugged with coagulated material. Some of the conducting cells in the veins of affected leaves are also plugged, clogging being due here to both crystals and coagulated material.

Bonnstine (D. R.). **Notes on some new or interesting fungi.**—*Mycologia*, xxxiii, 1, pp. 17–22, 1941.

This annotated list contains 14 species from the United States, of which two are new to science. *Microsphaera platani* Howe attacking both the young and the older leaves of the oriental plane tree (*Platanus*) [*acerifolia*] was collected in six localities, and at Overbrook, Philadelphia, the fungus has become a menace to shade trees. The conidial stage is distinct from *Oidium obductum*, and the perfect stage, found at Camden, New Jersey, is considered by some to be a form of *M. alni* (Wallr.) Salmon.

Bailey (H. E.). **Contributions to the biology of Polyporus rheades (Pers.) Fries.**—*Bull. Torrey bot. Cl.*, lxviii, 3, pp. 198–201, 2 figs., 1941.

Polyporus rheades is stated to be of common occurrence in California, where it causes a destructive white-piped rot of oak. It is particularly prevalent in the vicinity of Mount Diabolo, Contra Costa County, where sporophores have been found on several species of oak, *Quercus wislizenii*, *Q. lobata*, and *Q. douglasii* being those most severely attacked.

Sporophore formation generally takes place between September and November, scarcity at other times possibly being due to insect attack. In nature, sporulation may be very copious. Sporophores produced in culture cast spores abundantly, some for 30 days; the spores shed during this period in one culture weighed over 100 mg. (air-dry weight). Spore germination under laboratory conditions was erratic and the percentage was low. It occurred, however, to the extent of about 15 per cent. in a malt extract medium in which the mycelium had been grown.

When blocks of *Q. agrifolia* exposed to infection were kept in a damp chamber at 25° C. the wood became progressively lighter, and in advanced stages had a bleached appearance, with thin, dark, zone lines passing irregularly through it. The rotted wood was stringy, soft, and spongy, and could easily be torn apart with the fingers. Chemical analyses showed that as samples were taken at successive intervals there was a progressively greater utilization of each of the wood components by the fungus.

Tehon (L. R.) & Harris (H. A.). **A Chytrid inhabiting xylem in the Moline Elm.**—*Mycologia*, xxxiii, 1, pp. 118–129, 14 figs., 1941.

The discovery of a Chytrid in 1932 on a diseased Moline elm at Madison, Wisconsin, lead to the establishment of a new genus, *Carpenterella*, to include this Chytrid, named *C. molinea* [with Latin diagnoses for both the new genus and species], and possibly the very similar, as yet unnamed organism described by Carpenter [see above, p. 276] on sugar-cane. All attempts to isolate the organism in culture failed, but spherical bodies found in discoloured sections of the wood are believed to be oospores, and primitive thalli were observed in xylem cells. Cultural trials and microscopic examination failed to show the presence of any other organism in the diseased elm, but there is no conclusive evidence as to the Chytrid being the cause of the disease. Its occurrence within the elm, however, suggests that

Chytridiaceous organisms can invade tissues in the trunk and branches of woody plants and might possibly assume there the roles of parasites or commensals.

HIRANE (S.). **Studies on the parasitism of the rust of Acacia confusa Merrill, Maravalia hyalospora (Saw.) Diet. III. A cytological study of different regions of phyllodes with varying degrees of resistance to urediospore infection.**—*Ann. phytopath. Soc. Japan*, x, pp. 171–185, 2 pl., 1940. [Japanese, with English summary.]

In further studies on the mode of infection of *Acacia confusa* by *Maravalia hyalospora* in Formosa, Japan [*R.A.M.*, xviii, p. 489], both the very young, rapidly growing, and mature, fully developed portions of the phyllodes were found to afford unfavourable conditions for the development of the parasite, which can only pursue its normal course in the regions of intermediate age and activity. It would appear from these observations that the resistance opposed by the host tissues to *M. hyalospora* is of a protoplasmic nature.

IVANOFF (S. M.) & IVANOVA (Mme V. I.). О причине гибели отдельных деревьев Тунга Фордии. [On the cause of dying of some trees of Tung Fordii.]—*Sovetsk. Subtrop., 1940,* 10, pp. 26–31, 8 figs., 1940.

In the spring of 1939 a drying up of a few tung Fordii trees [*Aleurites fordii*] was observed on plantations in the Georgian S.S.R. The next spring, after a more severe winter, approximately 5 per cent. of the trees, comprising the most vigorous and fertile, were affected along the Black Sea littoral of the Caucasus, and a loss of 20 per cent. of the entire tung production of 1940 resulted. The condition is believed to be identical with bronzing [*R.A.M.*, xvii, p. 781] or due to some similar physiological factor. The symptoms, which varied widely, included an abnormal dark bronzing of either the entire lower surfaces of leaves or parts of them. Sometimes a velvety, brownish film, seen under the microscope to consist of very fine hairs, was observed on the lower surfaces of leaves, while the upper surfaces were light green. Later, necrotic spots developed and the leaves became curled and dropped, or turned yellow and dropped without developing necrosis. The bronze colour on the rosette leaves disappeared entirely or partly as the season advanced, the new leaves showing the characteristic velvety film and being often deformed. Chlorosis, resembling frenching [loc. cit.], was exhibited by some trees, accompanied, in severe cases, by shortened leaf stalks and stunted leaves.

GREGORY (J N.). **X-rays and timber defects.**—*J. Coun. sci. industr. Res. Aust.*, xiii, 4, pp. 310–312, 4 pl., 1940.

Most of the major defects, including decay and gum pockets, in eight wooden poles were clearly shown up by the application to sections 12 to 18 in. in length of X-rays [*R.A.M.*, xviii, p. 563], the negatives of which provided useful data in the examination of the faulty material. The method is considered to carry definite commercial possibilities, especially for the non-destructive analysis of the timbers used in the erection of bridges and other large structures, the removal of which

on the grounds of mere suspicion of internal rotting would thus be obviated: for ordinary purposes its use is likely to be restricted by considerations of expense.

DESPEISSIS (J. L.). **A preliminary investigation of blue-stain in 'kauvula' timber.**—*Agric. J. Fiji*, xii, 1, pp. 23–25, 1941.

'Kauvula' (*Endospermum* spp.) timber in Fiji, used for making butter boxes, is commonly affected under Australian conditions by blue stain [*R.A.M.*, xix, p. 507], due to *Ceratostomella* spp. As timber with a moisture content of under 20 per cent. of its dry weight is unaffected, the timber is steamed, to expedite seasoning, as well as to deodorize it. The standard practice at the Walu Bay timber yard is to treat with a cold solution of 5 per cent. borax for several seconds. Results are moderately satisfactory, but blue stain still occurs to some extent.

FINDLAY (W. P. K.). **Effect of addition of sugar on rate of decay of wood.**—*Ann. appl. Biol.*, xxviii, 1, pp. 19–22, 1941.

Experiments are described, the results of which indicated that the addition of small amounts of sucrose had little effect on the loss in weight of wood invaded by *Lentinus lepideus*, *Coniophora cerebella* [*C. puteana*], or *Polystictus versicolor*. Where the concentration of sucrose solution was 5 per cent., the loss in weight (the weight of the sugar absorbed being disregarded) was in every case less than that of the controls. In a second experiment with *Merulius lacrymans*, *C. puteana*, *Poria vaillantii*, and *Lenzites trabea*, and using 1 and 2·5 per cent. dextrose, a similar result was obtained. Thus, there was no evidence that the addition of dilute solutions of sucrose or dextrose stimulated the growth of the test fungi in such a way as to increase their wood-destroying capacity. In fact, *Lentinus lepideus*, *C. puteana*, *M. lacrymans*, and *P. vaillantii* appeared to cause less destruction in the presence than in the absence of added sugar. These organisms probably utilize the more readily available carbohydrates rather than the polysaccharides, with the result that once the former have been consumed, decay proceeds at about the same rate as in untreated wood. For instance, the loss in weight in control blocks due to *C. puteana* after five weeks was 4·7 per cent. more than in the blocks with 5 per cent. sucrose (no allowance for weight of sugar), and after ten weeks was 4·1 per cent. more. With *Polystictus versicolor*, after five weeks the controls had lost 2·8 per cent. more in weight than the blocks treated with 5 per cent. sucrose, and after ten weeks 3 per cent. more. Evidently, treatment with a 5 per cent. solution of sucrose has no appreciable preservative effect; very much greater concentrations of sugar would be required to raise the osmotic pressure of the solution enough to inhibit fungal growth therein.

These results support Gäumann's view [cf. *R.A.M.*, xvi, p. 354] that variations in the content of soluble carbohydrates do not substantially affect the liability of wood felled at different seasons to decay by wood-rotting organisms, and that differences observed are due to variations in the condition of the cell walls.

Woodman (R. M.). **The nutrition of Turnips.**—*Ann. appl. Biol.*, xxviii, 1, pp. 1–7, 1 pl., 1941.

The results of experiments [which are described in detail] on the influence of variations in the supply of inorganic nutrients on the growth of turnips in sand in pots under greenhouse conditions demonstrated, *inter alia*, that potassium deficiency led to a grey-green scorch, foliage limpness, and leaf drop, though yield was not greatly diminished until a rather low level of available potassium was reached. Absence of boron caused foliage wastage and finally induced the death of the plant, the turnips being tiny, rough-sided, and with a tendency to rot. The presence of 0·0681 p.p.m. of boron, as borax, gave normal plants.

Coons (G. H.) & Stewart (D.). **U.S. 200×215, a new Beet variety resistant to leaf spot.**—*Sug. J., Louisiana*, iii, 2, pp. 7–10, 1940. [Abs. in *Int. Sug. J.*, xliii, 508, p. 123, 1941.]

The release of the U.S. 200×215 sugar beet variety, which is reliably claimed to be resistant to leaf spot [*Cercospora beticola*], is regarded as particularly timely in view of the emergency situation arising out of the European war conditions and involving the cessation of importation of foreign seed by the farmers of Michigan, Ohio, Indiana, and other States of the American Union.

Wood (F. C.). **Note on Xylaria vaporaria: an invader of Mushroom beds.**—*Gdnrs' Chron.*, Ser. 3, cix, 2831, p. 131, 1941.

The author reports that since 1935, *Xylaria vaporaria* [*R.A.M.*, xiv, p. 555; xix, p. 617] appears to have become much less common in cultivated mushroom [*Psalliota* spp.] beds in England, presumably because of improved sanitary methods. With floor beds, the usual practice, before laying down the compost, is to flood the glasshouse soil with one of the proprietary cresylic acid preparations, after easing the soil with a fork. The compost is generally partially cured beforehand outside the glasshouse under a Dutch barn, and for the last stages is fumigated in the house with sulphur dioxide when fermentation heat is greatest. Further, most growers use pure culture spawn, and also sterilize the casing soil.

S. (J. M.). **The preparation of Mushroom compost.**—*Gdnrs' Chron.*, Ser. 3, cix, 2829, p. 116, 1941.

Detailed instructions are given for the preparation of mushroom compost from strawy stable manure from corn-fed horses in hard work.

Springensguth (W.). **Die Kultur des Manioks, seine Krankheiten und Schädlinge im Litoral des Staates St. Catharina (Brasilien).** [Cassava cultivation, its diseases and pests on the coast of the State of Santa Catarina (Brazil).]—*Tropenpflanzer*, xliii, pp. 286–306, 1940. [Abs. in *Chem. Zbl.*, cxi (ii), 23, p. 3248, 1940.]

Cassava seed destined for cultivation along the coast of the State of Santa Catarina, Brazil, should undergo disinfection against *Fusarium*, while *Cercospora* [? *caribaea: R.A.M.*, xvii, p. 651] should be combated by spraying the plants with Bordeaux mixture plus arsenic. An interval of at least three years should elapse between successive plantings of the

crop, to the health of which natural and synthetic fertilizers, especially potash, are indispensable. Stems and foliage should be burnt after the harvest.

DUNNE (T. C.). **Wastage in export Grapes. Preliminary studies with potassium metabisulphite.**—*J. Dep. Agric. W. Aust.*, pp. 439–443, 1940. [Received April, 1941.]

In preliminary, small-scale experiments carried out in Western Australia in 1940 on the prevention of fungal wastage in stored export Ohanez grapes [cf. *R.A.M.*, xix, p. 286] 40- and 100-mesh potassium metabisulphite was used at the rates of 5 and 10 gm. per case of fruit, the cases being only half-packed, but made to contain about 30 lb. of fruit. The preservative was mixed with the granulated packing cork immediately before packing; where it was applied 'top and bottom', half the quantity was spread on the paper before packing, and the remainder was spread over the top layer of cork. All packing was carried out in the field.

In the first test, fruit was used from a vineyard in which in 1939 considerable wastage had occurred from *Penicillium* moulds. Some of the cork used in the test was contaminated. Packing was effected on 29th March, the cases were placed in cool storage next day, and separations of rotted berries were made on 18th and 20th July. Two cases were used for each treatment. At the second separation the two cases treated with 5 gm. of the chemical (40-mesh) had, respectively, 3·8 and 9 per cent. rotted berries (by weight) for the two separations together, the corresponding figures for the 10 gm. treatment (40 mesh) being 3 and 5·4 per cent., for 10 gm. applied top and bottom (5 gm. each, 40-mesh) 17·1 and 8·9 per cent., and for the controls 54·1 and 50 per cent.

In the second test the fruit was obtained from a vineyard severely affected by *Botrytis cinerea* in 1939. All the grapes were sprayed with a spore suspension of this fungus shortly before packing. The fruit was packed and placed in cool storage on the same dates as in the first experiment, and separations were made on 30th June and 3 days later from one case and 1st August and 3 days later from the other. With 5 gm., 40-mesh, the second case (figures were not obtained for all the cases) totalled 7·7 per cent. rotted berries for the two separations; with 10 gm. 40-mesh, the two cases totalled, respectively, 4·2 and 4·4 per cent. rot; with 2 gm., 100-mesh 8·2 and 27·4 per cent.; with 5 gm., 100-mesh 5·2 for one case; with 10 gm., 100-mesh 4·6 and 6·1; with 10 gm., 40-mesh (5 gm. each top and bottom) 5·7 and 2·8; and with 5 gm. each top and bottom large crystals (one case only) 23·2 per cent., the figures for the untreated controls being 24·3, 29·6, and 59·2 per cent. Control thus resulted in every instance, except where only 2 gm. of the chemical or large crystals were used.

DEL CAÑIZO (J.). **Los tratamientos del Viñedo (datos practicos).** [Vine treatments (practical data).]—*Bol. Pat. veg. Ent. agric., Madr.*, ix, pp. 67–71, 1940.

The author has collected data from collaborators in various parts of

Spain concerning the application of disinfectant treatments against vine pests and diseases. Downy mildew (*Plasmopara viticola*) is combated in the Rioja vineyards by four applications of Bordeaux mixture, the first when the racemes emerge from the buds, the second 10 to 18 days later, the third at blossom formation, when racemes and leaves should be sprayed separately, and the fourth (to be omitted in seasons of mild infection) 20 to 25 days thereafter. The consumption of the fungicide is estimated as 224, 490, 1,540, and 910 l. per ha., respectively, making a total of 3,164 l. per ha. In the experimental vineyards of Navarra, the corresponding amounts of Bordeaux mixture consumed are 333, 775, 1,200, and 1,283 l. per ha., making a total of 3,591 l. In this region a fifth treatment with a copper dust is sometimes requisite. Four treatments at least, and six or more in years of severe attack, are given in the viticultural district of Panadés (Barcelona), the first in the early days of May, when the buds are 20 cm. in length, the second during the first fortnight of June, the third in the latter half of the same month, and the fourth in mid-July, the supplementary sprays being applied, when necessary, at 10- to 12-day intervals. In normal seasons the quantity of copper sulphate consumed per 1,000 stocks is 12 kg.

Espalier vines may be treated by means of the 6 h.p. Holder Autofix gasoline-oil motor sprayer, with a charge of 300 l., working at a pressure of 25 atmospheres. The apparatus can be operated by one man, and under the planting conditions obtaining in Murcia an area of 5 ha. is covered in the course of an eight-hour day. Using a Vermorel or Perrás knapsack sprayer, 15 men can treat an area of 12·5 ha. in an eight-hour day in the same vineyard.

Three applications of sulphur are normally given in the Rioja for the control of *Uncinula necator*, the first generally about the middle of May, the second when the vines are in full flower, and the third when the leaves of susceptible varieties (Muscatel, Viura, and Mazuelo) begin to contract. Using a Torpille (Vermorel) knapsack sprayer, the quantities of sulphur consumed at the first, second, and third treatments are 8·4, 24·5, and 35 kg. per ha., respectively. In Navarra, where four treatments are applied, the average sulphur consumption during a six-year period was 10·4, 20·2, 25·9, and 27·9 kg. per ha., respectively, one man covering 120 to 160 stocks per hour. By means of the Aquilón horse-drawn apparatus (Vermorel), discharging 15 to 400 kg. sulphur per hour, 12 ha. may be treated in an eight-hour day under the system of espalier planting practised in Murcia.

Costa (F.). **Regiões infestadas pela bacteriose da Mandioca.** [Regions infected by the bacteriosis of Cassava.]—*Biologico*, vi, 11, p. 332, 1940.

An Order of the Minister of Agriculture of Brazil, dated 30th October, 1940, prohibits the sale of cassava cuttings from the following States infected by bacteriosis (*Bacillus manihotus*) [*R.A.M.*, xvii, p. 650]: Espirito Santo, Rio de Janeiro, São Paulo, Paraná, Santa Catarina, Rio Grande do Sul, Minas Gerais, Goiaz, and Matto Grosso; excepted from the regulation are small quantities of certified material of resistant varieties.